THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXXIII. No. 818.] LONDON, JANUARY 14, 1879. [31ST YEAR.] Price 6d.

GAS PURIFICATION
BY
OXIDE OF IRON.

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LONDON DEPÔT:
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DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES,
RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

The want of gaslight, caused by the freezing of Wet Meters, is a very general source of complaint, and it is acknowledged that all attempts to remedy the evil have proved futile.

The want of gaslight, during the dark, foggy weather of mid-winter, when gas is most needful, is a source of great loss both to Gas Companies and the public. The convenience and economy of gaslight is so great, compared with any other artificial light, that there is no valid ground for believing that it can be supplanted, and, until coal becomes many times dearer than at present, it must remain the cheapest and most convenient source of light and heat. It is especially to be regretted when Gas Companies are making every exertion to remove all just grounds of complaint, and, as far as possible, to consult the public convenience, that the annoyance caused by smoky and unsteady flames, or the total extinction of the lights consequent on the freezing of wet meters, should induce the public to lend a ready ear to the fallacy of the electric light as a substitute for gas.

The destructive influence of the expansive force of water while freezing is familiarly known in the bursting of water-pipes during frost; but the injury to Wet Gas-Meters, although quite as real, being internal, is not so apparent. The internal parts of Meters which have been frozen are warped or ruptured, and they frequently receive further injury by the hasty and unskilful method of thawing them, which often melts the solder as well as the ice, unfastening the bearings or other parts of the Meter, thus admitting of large quantities of gas passing unregistered. No Meter, which has been once frozen, should be allowed to remain in use until it has been opened and thoroughly repaired.

It would be less loss to the Companies to allow the Consumers to burn gas for a time without Meters, until they can be replaced by **properly made Dry Meters** which register correctly, and with the action of which the most intense frost does not interfere. This is the only efficient method to prevent the injurious effects of frost upon Gas-Meters.

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They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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The Exposing of a large Amount of Effectually-wetted Surface (which is continually reproduced) to act upon the Gas.
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It is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured.

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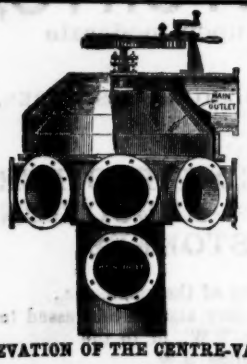
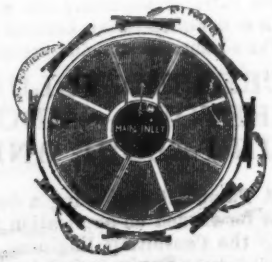
PATENT CENTRE-VALVES.



ELEVATION OF THE CENTRE-VALVE.

PLAN OF THE VALVE.



PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

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FOR PURIFIERS, GASHOLDERS, BYE-PASS, AND OTHER ARRANGEMENTS REQUIRING VALVES IN GAS-WORKS.

The Faced Valves, as made by the Patentees, continue to give great satisfaction, and they are being used extensively by many of the best gas engineers of the day.

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References can be given to many Engineers of high standing, who will testify as to the favour in which they are held.

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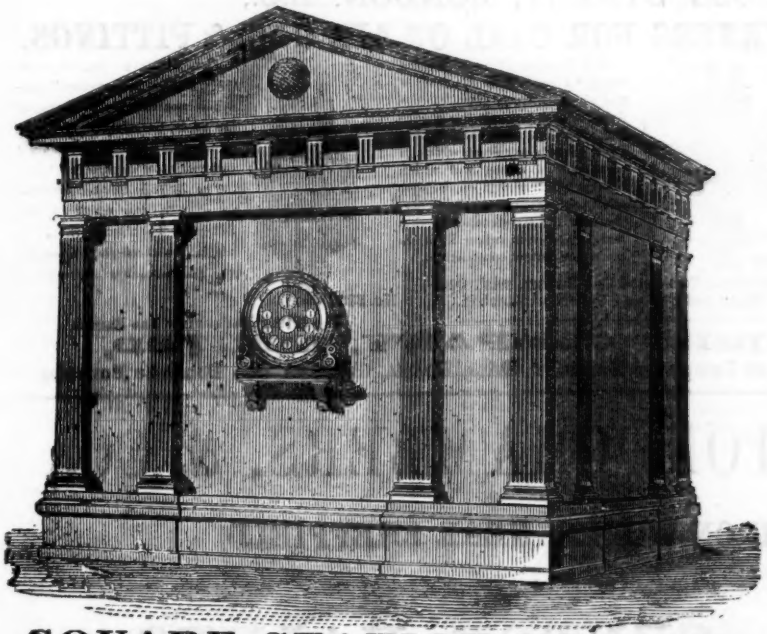

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GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

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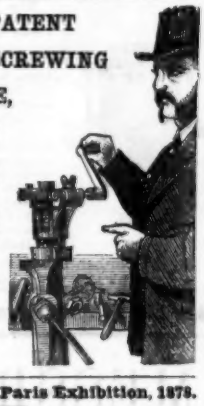

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

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GOLD MEDAL (Rappel) for Metallic Bedsteads and Furniture.

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Manufacturers of SILBER BURNERS FOR COAL OR AIR GAS, & FITTINGS.

No. 285.

The *World* says: "The light given by these Burners, besides being abundant in quantity, is almost like sunlight in its quality, so that it produces the same spectrum when refracted through a prism, and allows even the most delicate shades of colour to be distinguished."

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The Silber Tubulated Gas-Burner.

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The Silber Tubulated Gas-Burner, with Opal Shade and Cup and Governor attached.

The *London Medical Record* says: "This uniform blending of the air with each part of the flame results in rendering it pure and white, and very considerably lessens the blue colour, which is significant of waste, and which is very plainly visible at the base of all imperfect lights. The creation and the maintenance of this white light—not yellow light—is a proof of perfect combustion.

No. 286.

The Silber Bat's-wing Gas-Burner

The *Sanitary Record* says "Mr. Silber's improvements render it possible to eliminate, as far as is practicable, the sulphuric acid due to the incomplete combustion of impure gas."

The *British Medical Journal* says: "In the whole of Mr. Silber's inventions there is noticeable a complete attention to, and adoption of, natural laws."

THE SILBER LIGHT COMPANY, LIMITED,

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(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.

Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1862, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1878.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,

(Signed) JOHN JOHNSON.

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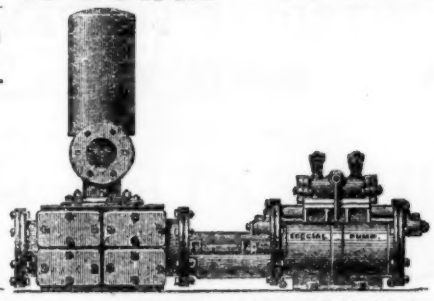
THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1¼	9	450	£16
4	2	9	815	18
5*	2¼	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



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PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

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DRY GAS-METER MANUFACTURERS,

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THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

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2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
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10th, Will not cost more than one-half for repair that Wet or Water Meters do;
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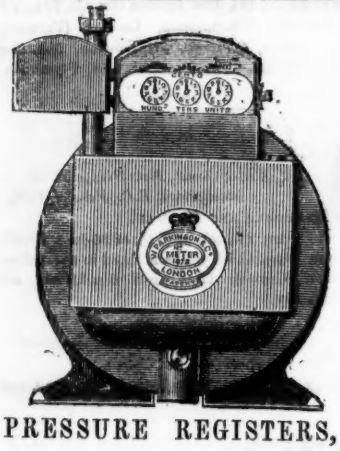

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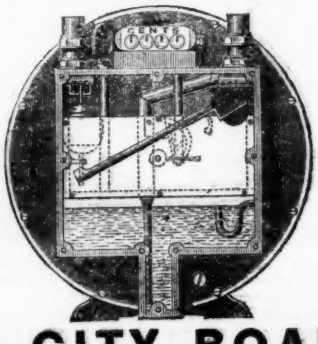
In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

J. N.—*An ordinary well constructed condenser will do what you wish fairly well; but the best thing you could use would be the apparatus invented by MM. Pelouze and Audouin, an illustrated description of which appears in Vol.* 1 *of the "Treatise," p.* 309 *et seq.*

G. A. N.—*Thanks for calling attention to the report. We had, however, seen it, and placed it in the translator's hands. It will probably appear in next* Journal.

Isca.—*Too late for this week.*

The Journal of Gas Lighting is supplied direct from the Office to any part of the United Kingdom, at the rate of 21s. per annum, payable in advance. If credit be taken, the charge is 25s.

Subscribers who desire to avail themselves of the reduction in the subscription to the Journal by paying in advance for the year 1879, are reminded that this can only be done during January.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 14, 1879.

Circular to Gas Companies.

It is not our fault that at the present moment we are compelled to recur, week by week, to the electric light. As a matter of fact, everybody talks about it, and every gas shareholder regards it with something like affright. The conversations do little harm, but a feeling of uneasiness is fostered, for which there is but little foundation. The most interested supporters of the electric light will not contend that the experiments made with it have been unequivocal successes. The lamps will not always keep alight, and when extinguished are not so easily re-lighted as some people imagine. The lights on the Thames Embankment have expired on some occasions, from what cause no one appears to know; and on Friday night last the electric lamps on the Holborn Viaduct did not illuminate the thoroughfare. Thus the uncertainty of the continuity of the light is clearly demonstrated. Very much is evidently required to be done before we can calculate on a steady maintenance of the light in its present stage of development.

The Phœnix Gas Company, under the direction of their Engineer, Mr. Corbet Woodall, made a bold experiment on Saturday evening last. They confronted the electric light with Mr. Sugg's new burners, and we may be excused for expressing a strong opinion, that the new burners give a superior light to that afforded by the electric lamp. We, of course, did not see the two in juxtaposition, and had only memory to guide us in making a comparison of the lights. But we can express an unqualified opinion that the lights, as exhibited at the corners of Stamford Street, York Road, and the "refuges," were superior to the electric light. We, however, rather object to the design of the lamps, on account of the number of ribs, which, to our mind, check the diffusion of the light; but as the experiment is only in its first stage, we may presume that this defect will soon be rectified. Taking it altogether, the experiment made by the Phœnix Gas Company is eminently successful. It is satisfactory to learn that the cost of this greatly improved illumination is not much in excess of the old system. Of this more will be said anon, when we possess fuller details; but whatever it may be, if the interests of the travelling public be considered, we are perfectly certain the Authorities will be in favour of the light afforded by the Gas Company. The beauty of the light and its diffusibility cannot be disputed. We have objected to the framework of the lamps, but that is a thing which admits of easy remedy. Demonstrations of a similar kind are shortly to be made by the Chartered Company between the Athenæum Club and Piccadilly Circus. If there be one spot in this wide waste of London that requires improved illumination it is Piccadilly Circus, which has long been a standing disgrace to the Vestry of St. James.

The electric light may, at the present time, almost be considered dead; but, at all events, it has had one very good effect, it has roused Gas Companies; and not the least consequence is the display by the Phœnix Company, which clearly demonstrates, as we have said before, that gas can successfully compete with electricity. The question of cost must be postponed, but we may hazard an opinion that, when it is summed up, it will be found that the charge for the new lights in the Waterloo Road, as shown on Saturday evening, will be far lower, light for light, than that for the display on the Thames Embankment. The Phœnix Company deserve great credit for making the experiment to which we now briefly call attention. It will be referred to hereafter, when we are more fully informed of the objects of the Company, and the means they employ to improve street illumination.

The Vestry of St. Pancras are very desirous to prosecute the Chartered Company for supplying gas alleged to be of lower illuminating power than is required by statute. There is a mystery in this case which we confess we cannot penetrate. On the one hand, we have the Local Examiner of the Metropolitan Board reporting the gas as quite up to the standard. The Superintending Examiner of the Board and others report it as more than two candles below. The Vestry Examiner reports it as sometimes very low and sometimes very high. How to reconcile these strangely discrepant statements, we do not know. We wish some one would inform us what is the burner actually used, and what is the rest of the apparatus employed in the testing of the gas. With regard to the intended prosecution, the Vestry are necessarily in a little difficulty. They will find, however, as we have told them before, that only the Metropolitan Board of Works can institute proceedings, and these must be based upon the reports of their own Examiner, uncontested by an appeal to the Chief Gas Examiner. We have, at present, little more than one side of the question, and it would be premature to express a confident opinion on the actual merits of the case.

The result of the poll of the Exeter owners and ratepayers has placed the Town Council and Gas Company alike in difficulties. The former are, for the moment, prohibited from proceeding with a Bill which, leaving out the clauses sanctioning the purchasing of the gas undertaking, promised to be a very useful measure. The expression of the owners and ratepayers was simply against the gas purchase, and but for the fact that the clauses authorizing this were included in the General Improvement Bill, it might have been proceeded with without question. As it stands, however, the purchase clauses have to be withdrawn, and the Bill, *minus* them, be once again submitted to the ratepayers, who will, no doubt, sanction its promotion at the expense of the borough rates. The Company are in urgent need of funds, and these they can only raise after giving long notice. The Town Council seem willing to make them an immediate loan; but what legal authority they have to be money-lenders on a considerable scale, we do not know. It appears to us that a Corporation like that of Exeter have no power to raise money, and then transfer the loan, at a higher rate of interest, to a commercial undertaking. Doubtless the difficulty will somehow be got over, but meanwhile the perplexity is extreme.

If any Gas Company in the kingdom deserve consideration

from a Local Authority, it is the Plymouth and Stonehouse, one of the best managed in the country, supplying gas considerably above statutory requirements, at a charge, we believe, the lowest made by any Company. They are about to promote a Bill of a very simple character, if seen in its proper light. They require power to raise further capital, and, while applying to Parliament, they very properly seek other powers, which Gas Companies, in the present state of affairs, are perfectly justified in endeavouring to obtain. They ask for authority to supply light furnished by electricity or any other means, and it is against this the Town Council so strenuously protest. They further want the illuminating power of the gas greatly increased—that is, to twenty candles—while they intend to ask that the maximum charge shall be reduced from 6s. to 3s. Three shillings per thousand for cannel gas in Plymouth, we should say, was impossible; whilst such high quality is undesirable, the gas supplied to Plymouth at the present time being sufficient for all needful requirements. The action of the Plymouth Town Council in this case is but one more illustration of the base ingratitude of Corporations.

A good deal of opposition is springing up throughout the country against the Bill promoted by the National Electric Light Corporation, Limited, and this is fully justified by the wide powers asked by the measure. The Corporation of Nottingham are taking the lead in this opposition, and we perfectly agree with the views expressed by their Town Clerk. It is, of course, well that these have been entered upon; but, as Mr. Johnson very properly puts it, there is no probability that a general measure of this kind will be passed in a single session of Parliament. Too much consideration could not be given to a Bill which, if carried, would empower a Company to disturb every thoroughfare, &c., in the kingdom. Gas Companies, we hope, will heartily join in the opposition. They have, at the present moment, a *quasi* monopoly of the thoroughfares, and to this they must adhere. It is not to be borne that any independent body, of doubtful constitution, should interfere with the rights of a Gas Company to illuminate either public ways or private dwellings. The right is theirs by custom and statute, and it must be maintained. As we have said, however, no Bill of the kind we refer to is likely to pass in the present session of Parliament.

We publish in another column a letter from Mr. A. Silverthorne, from whose views, it may be remembered, we have often differed. On the present occasion, however, we may cordially agree with him, except on one point, which has been referred to above. He has no more faith in the electric light than we have; he sees clearly all its deficiencies, and very correctly characterizes it as weird and ghastly. He accuses the Gas Companies of conniving at, and even promoting the success of the light, by seeking powers to furnish it if occasion arise. But Mr. Silverthorne should remember that Gas Companies, and his clients the Corporations, must provide for all contingencies. Having no fear whatever that the electric light will ever supersede gas, we still recommend Gas Companies, if they can, to secure the power to furnish the light which, if it should ever prove a practical success, might make their present industry valueless. We give the same advice to Corporations, who are, however, fully alive to their own interests.

We shall be excused for calling particular attention to the report of Messrs. Kirkham and Hersey, and to that of Mr. A. H. Wood, of Hastings, which appear in other columns. Both are eminently interesting documents, but they—the latter especially—exaggerate the importance of the electric light in its relation to Gas Companies. The Companies, so far as we can see, have nothing whatever to fear from competition with the electric light. It shines, it is true, in some of our thoroughfares; but we venture to say that no one imagines for a moment that it will ever replace lighting by gas. Mr. Wood and Messrs. Kirkham and Hersey may be perfectly content; for they may rest assured that gas illumination will last their time.

It is curious to see how infection spreads. News of the electric light has naturally extended to Canada, and the Consumers Gas Company, Toronto, have given notice of application, next session, to the Ontario Legislature—the opening of which will take place almost immediately—to promote a Bill which will give them all the powers for the supply of the electric light, or any other mode of illumination other than that produced by gas, which are proposed in this country. The close neighbourhood of Mr. Edison, perhaps, somewhat alarms the Company; but they may take our assurance that nothing will come of his multitudinous patents, and that gas will continue to hold its own against all competitors. Other questions are sufficiently answered above.

We do not think Mr. Jones need trouble himself much about the action of the New Weights and Measures Act upon the sale of coke. We quite agree that a three-bushel sack would be a very useful measure; but how is it to be defined? Coke will continue to be sold by the chaldron, as it always has been, and if any meddling inspector should interfere, a magistrate will make short work of him. We do not expect the smallest difficulties to arise, if old customs be rigidly adhered to. Nevertheless, the matter has been very properly ventilated, and both Mr. W. Livesey and Mr. R. H. Jones deserve the thanks of our readers for endeavouring to place the question in its true light. Our simple recommendation is that Gas Companies should go on disposing of their coke as of yore, and we are satisfied that no one will quarrel with them. The only change which might be made with doubtful advantage, would be to sell by weight; but this would involve a trouble which is quite unnecessary.

Water and Sanitary Notes.

We are sorry to say that Dr. Frankland's report for December is not quite so favourable as to the quality of the Metropolitan waters as it was in the preceding month. There is really, however, nothing to complain of. The water has been, in most cases, efficiently filtered, and it is quite unavoidable that organic matter should be contained therein. But this is of slight importance, considering the death-rate, which has been unusually low. The relations between the quality of the water supply and the death-rate have still to be considered, and at the present moment but few data are before us to make a determination of their connection. How far organic matter and moving organisms in water affect public health is a question still to be settled, but not perfunctorily. We must know which are prevalent factors of disease, not simply as regards the water supply, but the general state of health promoted by other means. If those who purvey information to us will only supply the hiatuses which are now exhibited in the official reports, we shall be happy to receive their communications.

It is confessed now that not only the City, but the whole of the Metropolis, is very badly protected from fire. It is said that it takes from ten to twenty-five minutes to get up steam for a steam fire-engine. In past times, unless our memory deceives us, a ring gas-burner was kept alight under every boiler, maintaining the water at nearly boiling heat, and when the engine was called out for active service, a few sticks of wood and lumps of coal sufficed to produce the force required to move the engine. We fancy, but without knowing positively, that the parsimony of the Metropolitan Board has caused the withdrawal of the gas-heating apparatus, and now cold water has to be raised to a temperature necessary to get up steam sufficient to actuate the machinery of the pumps. It stands to reason that this cannot be effected without a considerable expenditure of time and fuel, and the Metropolitan Board had better return to the system which, as we have said, was once practised, of keeping a ring of gas burning under the boilers, when they were out of use.

The manufacturers of Liverpool are, as a body, loudly complaining against, first of all, the cost, and, next, the quality of the water supplied to them. In one case—take that of sugar refiners—they do not want alkaline salts, and therefore they have no desire for well water. In another case—take that of distillers—they wish for a hardish water, and would rather have the well supply, although, as we read in a contemporary, they prefer to distil it. Putting all things together, it would seem apparent that the water supplied to Liverpool is still unsatisfactory in quality and quantity, and we greatly regret that the scheme for a new supply is not to be proceeded with in the present session of Parliament. Before the next, we hope a settled scheme will be fixed for the promotion of the Verniew or some other source of supply, and we shall know exactly what the Liverpool Water Committee intend to do in reference to the matter.

The Manchester City Council, fully supported by their constituents, have resolved on pushing their scheme for obtaining a supply of water from Lake Thirlmere. They are perfectly justified in thier determination, and we quite expect that a Parliamentary Committee will support them. The day has passed when sentimental objections could be raised to their endeavours to obtain a supply of water not only necessary for their local requirements, but for furnishing an efficient supply to towns lying along the line of the aqueduct. We regard this as a most important undertaking, and wish it every success. The opinion of the Town Council may be well ascertained by the fact that the promotion of the Bill was only opposed by two votes against fifty-five. So strongly presented to Parliament, we cannot help thinking that the views of the majority of the Town Council will be carried out, and that the Thirlmere scheme—one of the grandest ever proposed—will become an absolute fact.

CONSERVATION OF RIVERS.

THE general management of rivers is a matter which is daily becoming more prominent. In a very admirable address, delivered before the British Association, at its recent annual meeting held in Dublin, Mr. Edward Easton made several quotations from classical authorities, by which it would appear that the ancients, in many cases, showed a greater regard for rivers than we can very well boast of in England in the present enlightened age. In the days of great military monarchies there was a concentration of power which, if rightly directed, was peculiarly adapted for the due and proper management of great rivers. Nitocris took the river Euphrates in hand, so that whereas it previously came by a straight course to Babylon, it was made to pursue a winding one. So effectually was this done, that Herodotus says the stream came three several times within sight of the same village. Happily, the Thames is already sufficiently crooked, so that there is no need for any high authority to interfere for the purpose of rendering it more so. Nitocris was also eminent for the adoption of embankments. Who was the Babylonian Bazalgette we are not informed, for Herodotus generally gives the credit of these great works to the queen. It seems, however, that these grand operations were not altogether satisfactory in their results, for at a subsequent period the Euphrates was accustomed to "overflow and flood the whole "country round about," for the prevention of which further embankments were found necessary. Egypt, Greece, and the Roman Empire afford other examples of river conservation; and the phrase we sometimes meet with, "These are imperial works, "and worthy kings," is a fair deduction from the facts of ancient history. In England, the imperial system has been merged in the local. In the case of the Thames, the Lea, and some other leading rivers, there are Boards of Conservancy, but with a jurisdiction of too limited a character to effect all that is necessary. The watershed area, which really creates the river, is subject to various authorities, and the stream is affected by causes which are under no general and systematic control. The whole country is divided into "urban" and "rural" sanitary districts, and a large portion of its area—probably the greater portion—is confided to the sanitary and engineering skill of Boards of Guardians. Mr. Symons, who spoke at the Dublin meeting, adverted to the fact that sometimes a river was subject to more than a dozen authorities, all "fighting for different objects." Mr. H. Law expressed his opinion that the Public Health Act of 1875 exercised a most prejudicial influence, so far as the sanitary work of rivers was concerned, inasmuch as it divided the whole country into areas which had no significance whatever in regard to those features of level by which such areas should be especially determined. Placing these areas under the control of Boards of Guardians was appropriately designated "a mere political division." Mr. Law stated that, in his own experience, he knew of dozens of cases in which the most serious delays and complications had arisen from this cause, even to the extent of sometimes altogether preventing the carrying out of useful works. Mr. Clarke Hawkshaw mentioned, with regard to the Nene Valley drainage, that there were as many as seventeen different bodies to deal with the various interests concerned.

In respect to rivers, the state of affairs thus verges on chaos. Nitocris is wanted, or Semiramis—some well organized power to care for the river in its entirety. We cut up our rivers into sections, and in our treatment of the country we seem to expect that Nature will conform to Acts of Parliament. If statesmen are prepared to appreciate a "scientific frontier" for political purposes, much more ought they to rectify the sanitary boundaries of the country, so as to make them at once scientific and natural. The nation has to pay a price for the neglect and mismanagement which affect our drainage areas and rivers. Every year we are mulcted of large sums of money by the loss of water power, and at frequent intervals there are disastrous floods. The latter cause alone is said to have inflicted a loss of several millions sterling on the United Kingdom in the summer of 1875. The subject is one which has been frequently pressed on the attention of the Government, and certainly will not be allowed to slumber. A Select Committee of the House of Lords, with the Duke of Richmond as Chairman, presented a report in 1877, which spoke very explicitly. It was therein shown that considerable damage had been caused in various parts of England by the prevalence of floods during the previous winter, and "that such "floods have been more frequent, and of longer duration, in "recent times than formerly." Deterioration in river channels, and the very general adoption of subsoil drainage, were the leading causes assigned for this unhappy state of things. The Committee were impressed with the idea that if the channels and outfalls of rivers were properly cared for, any water flowing into these rivers from the catchment basins of which they are the outlets, might be reasonably expected to be discharged "without any serious damage to agricultural lands by floods." We would observe, however, that the question is not merely one of "agricultural lands," but also of dwellings and towns. "Floods of moderate duration," it is stated, "are not always "prejudicial" in the open country, but, on the contrary, have the effect of improving and fertilizing grass lands by the deposit which they bring down. So far the agriculturist may be content; but the towns desire to have no floods at all. Reviewing the state of the law, the Committee recognized the evil effect of having several distinct authorities exercising their powers along the course of a single river. From this cause, they stated, "conflicts have arisen which are fatal to the adoption of any "uniform and comprehensive scheme for the conservancy of the "river as a whole, and there is, moreover, an absence of respon-"sibility, which may be held to account, in a great measure, "for the present neglected state of several important streams." Private legislation has added its complications to the general entanglement, there being somewhere between two and three thousand private Acts now in operation, which relate to drainage, navigation, and matters of a similar kind. The interests of the parties on whose behalf these Acts have been obtained, are "frequently found to conflict with the due "exercise of the powers granted under public Acts" by which it was intended that rivers should be governed.

The witnesses who appeared before the Lords Committee were almost unanimously of opinion that, in order to secure uniformity and completeness of action in dealing with each river, each catchment area should, as a general rule, be placed under a single body of Conservators, who should be responsible for maintaining the river, from its source to its outfall, in an efficient state. This is a clear and comprehensive view of the case, and in that view the Committee declared their "entire concurrence." With regard, however, to tributary streams, the Committee considered that the care of these might, in some cases, be entrusted to district committees acting under the general direction of the Conservators; but near the point of junction with the principal river, such streams should always be under the direct management of the Conservators of the main channel, who should be a representative body, constituted of residents and owners of property within the whole area of the watershed. It was, however, allowed that a tributary stream might, in some cases, be of such magnitude and importance as to require a separate Conservancy Board for itself. To prevent the occurrence of a deadlock between the authorities of the tributary stream and those of the main channel, it was suggested it might be desirable to vest, in some supreme body, the power of deciding differences which might arise between the two co-ordinate bodies. In accordance with the prevailing principle of "permissive" legislation, the Committee recommended that the appointment of a Conservancy Board should result, if possible, from the application of persons having an interest in the district. Such application being made, a Government Inspector should be sent to the spot, who would ascertain the necessities and the capacities of the district, and suggest the area and the proportions of taxation. A scheme should then be prepared, objections heard, and finally a Provisional Order submitted to Parliament for confirmation. Among the powers to be conferred on the Conservancy Board, the Committee proposed that the provisions of the Rivers Pollution Prevention Act should be included. With regard to the principle of assessment which should be adopted in raising the requisite rates, the Committee found—as might be expected—"much variance of opinion." The Committee, speaking for themselves, said they were "strongly of opinion that "towns and houses should contribute to the rates in ques-"tion." It is difficult to see how this conclusion is to be avoided, if "towns and houses" are to benefit by the operations of the Conservancy Board. As for the uplands, which are not flooded, the Committee considered that they ought to contribute to the rates, seeing that they already "contribute their quota of waters." That is to say, if the uplands are not flooded, they are the cause of floods, and ought to help in paying for the prevention or mitigation of such calamities. Still it is conceded that they ought not to be taxed to the same extent as the property which is directly benefited. The principle of rating lands according to the benefit derived, which governs the statute of Henry VIII., is, however, replete with difficulties, and cannot be carried out in its integrity. The principle is one which the Committee say "appears to work unfairly in some instances, and to be incapable "of application in others." Yet, to tax equally all riparian lands included within a certain level, is a rule which "seems likewise "to be open to objection."

Embarrassed by these conflicting considerations, the Duke of Richmond's Committee recommended that the rates to be levied

by a Conservancy Board should be distributed over the whole area of a watershed, the lands and houses "below the flood "level" being rated at a higher amount than those above it, and "other graduations and exceptions being made to meet "particular cases." Subject to these recommendations, the Committee considered that the taxation required for drainage purposes should be levied on the basis of rateable value. We fancy the fixing of the "flood level" will be rather difficult. So long as nothing is done, the flood level may be expected to rise, thereby enlarging the area for maximum taxation, while, at the same time, increasing the scale and cost of the remedial measures. When a Conservancy Board has done its duty, the flood level will verge on extinction, and, in course of time, people may dispute their liability. Apart from this question of taxation, there is a general and growing outcry for something to be done. When the County Boards Bill was before the House of Commons last year, a deputation waited on Mr. Sclater-Booth, asking him to introduce certain clauses making it compulsory on the County Authorities to appoint Conservancy Boards. But Mr. Sclater-Booth did not see how he could carry out the views of the deputation, and we think it quite as well that County Boards and the conservation of rivers have been kept quite apart. Counties and watershed areas are not conterminous. A few weeks ago a very powerful deputation waited on the Home Secretary and the President of the Council, asking that a general Act should be introduced by the Government, defining the principles on which local measures should be framed for the prevention of floods, such measures to be dealt with by means of Provisional Orders. Mr. Cross signified that if somebody was prepared to pay, the Government would give the subject immediate attention, providing also that they could see distinctly what to do. Mr. Cross evidently wished to do something, but felt that he had a difficult and perplexing task before him. As usual, there are "conflicting interests," with no Nitocris to overrule them. There is a quarrel between the mountains and the valleys—the high levels and low levels—and it will not be easy to reconcile the difference. In the Dublin debate, Mr. W. H. Wheeler, of Boston, said: "For my part, I cannot see why a "mountain should not pay its share. The mountain is the "greatest sinner of the whole lot. It is the high land which "causes the floods to run down, and therefore why should it "not pay its share of the cost?" But, inasmuch as the mountains are not likely to be submerged, the mountaineers are very indifferent to the flood question, in addition to which it often happens that the only dwellers on the mountain side are grouse. Mr. Kelly considered it "rather absurd to tax a grouse mountain "for the drainage of the valley below." Taking an extreme case, Mr. Kelly went as far as the Himalayas, saying, "I should "like in India to see a bailiff levying a distress on the Hima-"layas for the drainage of the Jumna or the Ganges." Perhaps we may admit that the principle will fail when it is stretched so far, while it may admit of a very equitable application in the United Kingdom. Mr. Easton expressed his "firm belief" that an intelligent management of watershed areas would be found compatible with absolute profit to every interest affected.

The attention of Mr. Cross is about to be quickened in reference to this subject, by a memorial from the inhabitants of the Weybridge Valley of the Thames, complaining of the frequent floods, and stating that "the Board of Conservancy, as at pre-"sent constituted, appears utterly incompetent to cope with the "difficulty." It is not enough to have a Conservancy Board; it must be properly constituted, and possess the requisite powers. Mr. Easton proposes the establishment of a public department, analogous, in some respects, to that which already exists in France and Italy, having special oversight of matters relative to rivers and streams. What may be done by exercising systematic watchfulness, was shown in the case of the Seine during a critical period in the spring of 1876. The French engineers gave forty warnings in a month with respect to floods in the Seine and its tributaries. Cattle and other property were, in consequence, removed in due time, and the loss which the people suffered was comparatively very small. Mr. Easton advises that the Water Department of the State should be endowed with powers corresponding to those of the Local Government Board, and charged with the duty of collecting and digesting for use all the facts and knowledge necessary for dealing in a satisfactory manner with every river-basin and watershed area in the United Kingdom. This department should be presided over, if not by a Cabinet Minister, at all events by a member of the Government, who can be appealed to in Parliament. The department would have the entire charge of and control over all estuaries and navigable channels, seeing that these possess an international and military character. For the same reason, Mr. Easton would have the cost of amending and maintaining them defrayed out of the Imperial Exchequer. This part of the scheme, however, is one which strikes us as fatal to that unity of administration which is so necessary to the proper management of rivers. The Duke of Richmond's Committee simply proposed that where the rights of the Crown, or of public bodies, were concerned, special provision should be made. Concerning the rest of the watershed area, Mr. Easton agrees with the recommendations of the Committee. Perhaps, on the whole, we are not likely to see a much better plan than that which the Committee have sketched out, except that it fails to ensure the general adoption of the system, its actual application being dependent on the voluntary initiation of persons interested in the district. Possibly the people who live in the valleys are pretty sure to make application to the Government for the enforcement of the Act, so soon as the law is available for their help. Mr. Easton's proposed Water Department would be valuable as a centre of information, and probably something of the kind might be instituted with advantage, irrespective of the proposal that it should have the sole charge and control of the navigable rivers and estuaries. The imperial and international interests must doubtless be represented and protected in some way, but Mr. Easton seems to be carrying the principle a little too far. With this exception, a Water Department might be incorporated with the scheme laid down by the Committee of the Lords. Practically, something of the kind is pretty sure to come into existence, if our rivers are to be properly superintended.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE EXTENDED USE OF GAS.

Sir,—With reference to my article on the above subject, which appeared in your issue of the 24th ult., I have received the subjoined letter from Mr. Cowan, of Edinburgh, and as his remarks are based upon experience gained in the practical application of the system of lighting and ventilation I there recommended, I think you will agree with me that possibly they may be sufficiently valuable for publication *in extenso*. The letter is accompanied by one or two sketches of the form and mode of adjustment of the globe-light and ventilating apparatus he employs, which, if space permits of their insertion, will also, I believe, assist in rendering his views (and mine) more easily understood.

No further comment on my part is necessary, but to prevent the entertainment of any mistaken idea that the article is being thus advertised, I may state that the manufacture of gas-fittings of this description for sale is contemplated, at the present time, neither by Mr. Cowan nor myself; our sole idea, in thus drawing the attention of the gas world to the matter, being the wide field of usefulness we see open in this direction.

As, however, notwithstanding the electric "flare," I feel considerable confidence in the future of gas lighting, if any one similarly confident and interested should be desirous or willing to join in initiating some such undertaking as my article suggested, I shall be very pleased to discuss, by correspondence or otherwise, the practical measures necessary to such end.

34, *St. George's Road, Southwark, Jan.* 7, 1879. A. F. Wilson.

[Enclosure.]

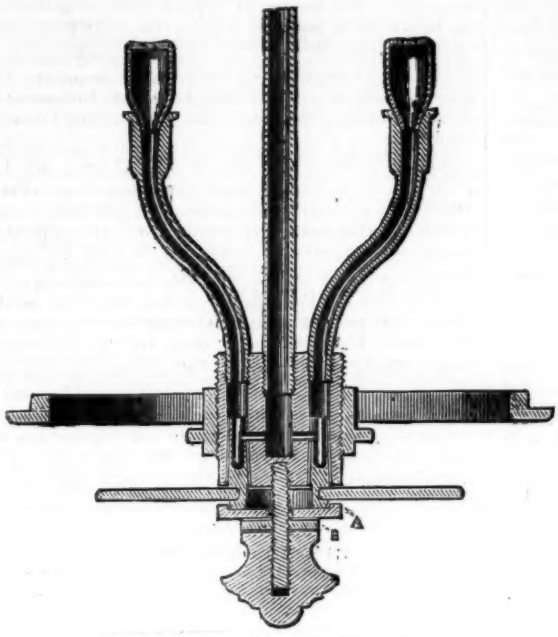
Dear Sir,—I have pleasure in giving you any information on the subject of ventilating gaslights. I have read your article in the Journal of Gas Lighting of the 24th of December, and agree generally with the views therein expressed. The "Auxiliary Companies" you propose are probably the best—perhaps, the only—means of giving a chance of their adoption to any material extent.

Persons will occasionally be found who, like myself, are disposed to incur the extra expense and trouble which attend the introduction of ventilating lights; but their number will prove as limited as is the knowledge of the general body of gas consumers on the questions involved.

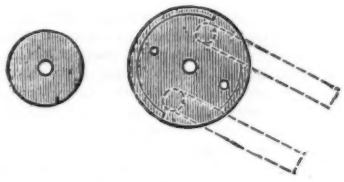
There are practically only two kinds of ventilating gas-fittings—the "sun burner" and the "ventilating globe." I agree with you, that the former "ventilates, like a furnace underneath a chimney-shaft, the apartment it illuminates;" yet, I think, you very properly dismiss it (so far, at least, as domestic lighting is concerned) with the remark that, "the light is expensive, because its brilliancy is really concentrated at a point distant from the part it is meant for." In large halls, and other places of public resort, where glass globes, suspended over the heads of persons below, would be suggestive of possible risks, "sun-lights" alone, are admissible; but, everywhere else, "ventilating globe lights" are in every way to be preferred.

Unlike the sun-burner, the ventilating globe gives off its light at the same elevation as an ordinary chandelier, and is not only not costly in its consumption of gas, but far more economical than the ordinary mode of lighting. As evidence of the greater light given, in proportion to the gas consumed, I may mention that my drawing-room (36 ft. × 17 ft.) is thoroughly well lighted by two 17-inch globes, with only two moderate bat's-wings in each. In rooms of more limited size, I have often observed a much inferior degree of illumination from three or four times the number of similar burners, distributed in brackets upon the walls, or on a central chandelier. The cause of the increased light is, I think, the more perfect combustion of the gas, due to its reaching a high temperature before being consumed, and the comparative purity of the air in which it is burned.

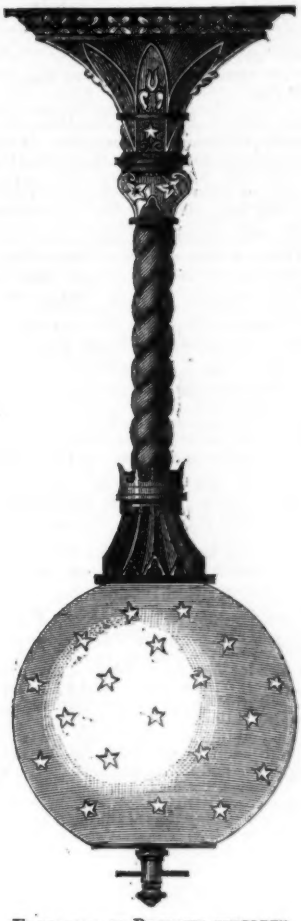
The loss of heat should not, in fairness, be charged against the ventilating globe, seeing that, under the ordinary system, heat is only obtained at the cost of a vitiated atmosphere. But, even if this loss be taken into account, I am of opinion that the gain in light is more than sufficient to cover what may be due to the heat being employed to ventilate rather than to warm the apartment. I observe, in your article, that you contemplate the possibility of utilizing the heat from the globe below, to warm the



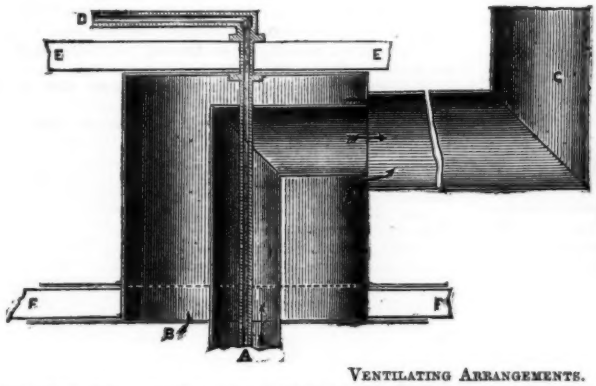
SECTION OF TAPS AND GALLERY.

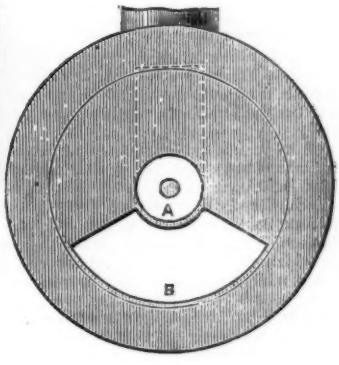


PLAN OF NUT B. PLAN OF CAP A.



ELEVATION OF PENDANT COMPLETE.





VENTILATING ARRANGEMENTS.

A, Flue from globe. B, Opening one-third of circle behind flue-pipe for air from room. C, Ventilating flue. D, Gas-pipe. E, Iron support between joists. F, Ceiling.

room above. This is, I believe, impracticable in the case of globe lights. The consumption of gas in them, and, consequently, the heat given off, being comparatively small, is all required in the flue itself, which, for that reason, should rather be prevented from, than assisted in, radiating it. With sun lights it may be different. My experience with them does not enable me to offer an opinion.

My experience of globe lights may be useful to others, and with this object I give it:—

The first globe I fixed was about seven years ago. I obtained it from a London firm. The result was not in all respects satisfactory. The burner being an Argand, the chimney breaking rather frequently was a source of expense and trouble. Then there was no tap on the pendant itself, so a stop-cock had to be fixed, on the pipe leading to it, in the wall of the room. This, in a large room, would be very troublesome, as almost necessarily causing the attendance of two persons when lighting—one to open the tap in the wall, and another to apply the taper to the burner through the opening of the globe. Various means were suggested to obviate this difficulty, but all were objectionable.

To get rid of the chimney (necessary to the Argand), I saw I must do away with the Argand itself; and a tap at the bottom of the globe seemed the best solution of the lighting difficulty. I found another London firm who appeared to fulfil these conditions, and to them I applied, with the result that I fixed two of their globe pendants, each with a bottom tap controlling two fishtail burners. That, however, did not satisfy me, because one burner was often enough to have lighted, and, in a bed-room, for instance, it was undesirable to have two turned-down lights, when one was both cheaper and more agreeable. Another objection was that (with, I suppose, a desire to preserve the shape of the globe as entire as possible) the opening below was so small as to cause a strong draught and make unsteady the lights.

My next object was to have a tap to each burner, and an opening equal to the admission of air at a rate proportionate to the demand. These improvements I had made by my firm here, and after more than two years experience of them in my own house, where I have ten globes fixed, and in the firm's offices, where there are seven, they are considered to be entirely satisfactory, making the use of gas one of the most health-preserving of indoor agencies, and still further assuring its position as the most economical of lights.

The annexed sketches show my double-tap arrangement, the pendant itself, and the box in the ceiling, which receives the products of combustion from the globe and the vitiated air from the room. As arranged, there are but two burners, each having its own tap; but it will be obvious that three, or even four taps (with a light to each) would occupy no more space. Or, without adding to the number of taps, the number of burners on the pipes leading from them might be increased, in the event of more light being required than two burners would supply.

It may be useful to mention, that I have tried unsuccessfully to make ordinary gas-brackets ventilating, by placing over them a shaft (similar to that of the globe light), terminating in a suspended half globe. That failed, a very frequent "blow-down" being the result. I then tried an entire globe of a large size on the gallery of the bracket, the upper opening discharging the products into, and up, the shaft above, which was almost close down upon the globe. That also failed; and (without expressing any opinion of what might have been the case had the shaft delivered into a chimney having a strong draught from a fire or furnace) I believe I am justified in ascribing the failure in this case to the absence of the descending gas-pipe, which, in the ventilating globe light proper, forms a hot core, and so increases the ascensional tendency of the products, and greatly lessens the probability of a "blow-down." As already mentioned, the heat from the globe light being usually so much less than that from the sun burner, it is desirable not to allow it to go too fast; hence I have found it advantageous to have some length of horizontal flue, even in those cases where it would be quite convenient to have it all vertical. I therefore consider that a room above the one in which

the globe light is used is not any drawback (so far as the draught is concerned), as the horizontal travel of the flue diminishes the chance of a "blow-down." And this may be further guarded against by placing a suitable chimney "cowl" on the end of the pipe (for instance, Howarth's Archimedian screw ventilator), making sure that it reaches the highest point of the building.

The removal of the products of combustion, together with the air vitiated by breathing, being thus provided for, a supply of air to replace that which is being constantly withdrawn is a necessity. Just as a fire in a room closed against the admission of air would smoke, so globe pendants, under similar conditions, would return, instead of remove, the products of combustion. An open, or even an imperfectly fitting door, will, no doubt, supply the necessary air; but it is better to draw this fresh from the exterior atmosphere, than from the inside of the house. For this purpose, I have openings in the walls, which are practically tubes (5 in. × 2 in. and about 5 ft. long); these are not vertical, but inclined from the outside to the inside of the wall, the inside opening being about 18 inches from the ceiling, and higher than the outside by the vertical length of the tube in its angled position. With rooms so provided, neither open doors nor windows are a necessity, either for health or comfort.

The greatest physical obstacle to the introduction of globe lights, is the absence, in most houses, of a shaft reaching from the line of the ceiling of the ground floor to the top of the building. Where there not such a shaft, globe lights are with difficulty fixed in any but the rooms in the top storey; because there is usually no room in any of the storeys up the walls of which the flues can conveniently be carried. In the upper storey this is not experienced, the ceilings of the rooms of it being near the roof. Where, however, a shaft, such as that above referred to, is provided, all the storeys are equally available for, and easily fitted with globe lights; the flues being carried under the floors of the rooms above, into, and up, but independently of the shaft, and through the roof. If architects were to plan all houses with such shafts, the chief difficulty of introducing globe lights would cease to exist.

But, in the meantime, we must deal with houses as they are, and when globe lights are desired in the lower storeys, it is necessary to find space, against the walls of a room or closet, in each storey, up which the flues may be carried, till they reach the roof, through which they must pass, and be terminated by a "cowl," such as the one before referred to. Several flues may, if desired, be carried into one box of adequate size, and thus be united (beyond the box) in one pipe, with a view to avoid an opening in the roof for each flue. But, in this case, each flue, where it enters the box, should be partitioned off, in the line of the current, from all the others, and the ventilating screw cowls be powerful enough to create a draught in all the flues. I have in my house two such groups, of three globes each, and in the firm's office there is one of four globes. The screw ventilator, in addition to helping the draught when the lights are burning, is ever active and useful to ventilate the house. The only thing I have to add is, that I have recently still further improved the globe itself, by having it made with a "bottle neck" at the upper opening. This (delivering into the receiving part of the shaft of the pendant, which comes down over the outside of it) forms an annular space of some length, up which the vitiated air from the room passes to the shaft. The advantage of this arrangement is, that it lessens any chance of a return of the products from the globe, and increases the draught. In like manner, the ceiling opening (for the vitiated air from the room) I now make only one-third of the circle, and keep this space behind the knee which leads the products into the flue-pipe.

(Signed) WILLIAM COWAN.

Edinburgh, Jan. 4, 1879.

THE ELECTRIC LIGHT.

SIR,—I notice a remarkable letter, signed "A Gas Shareholder, in your last issue." In that letter there is much in which I can concur, and if you consider my concurrence of any use to the gas interest threatened by a large section of the leading Press, you are quite welcome to publish these few remarks.

It may be imputed to your correspondent that he is a shareholder himself, and has an interest at stake. I am not. Besides, I can hardly be suspected of bias in favour of gas companies, as it is pretty well known that I have occasionally dealt severely with their shortcomings. But, between criticism, armed with an honest weapon—statistics—for the purpose of cheapening a production of universal consumption, and the kind of abuse which has lately been levelled at gas companies, there is, I think you will admit, with your usual impartiality, a wide difference.

For my own part, I have noticed, with intense disgust, the line of conduct assumed towards the gas interest at this juncture; the unfounded attacks of which it has been made the object; and, more especially, the ignorant premises of its interested assailants. There is, however, much comfort in the reflection, that those who write so glibly, in the public Press, about the electric light, know, at least, nothing of the manufacture of gas, its progress, its strength, or its future resources.

To be rightly judged, of course, the electric light required to be seen in operation on a rational scale. Until then, it was fair to suspend one's views. We have now seen it, and, if any one believes that the weird and pulsatory light seen on the Embankment is the light of the future, he must be a singularly sanguine man, or a shareholder in the "Société Générale d'Electricité."

1. The light is one to which our eyes would never get accustomed, besides being eminently destructive to the visual organs.

2. It is neither diffusive, nor does it show off colour to any advantage, notwithstanding its intensity.

3. Seen through globes, it is painfully ghastly, and produces on the human face a sickening look of pallor.

4. I have seen no electric lights yet in which there is not a jerky and most unpleasant intermittent movement—something like gas when the water has condensed in one of the pipes, through which the gas forces its way every quarter of a minute. In one case, this arises from the regulator in use; in the other case, it is due to the steam-engines; but it is remarkable that both the Jablochkoff and Lontin lights—distinct systems—present, in a different degree, the same objection.

Without looking at the question of cost, but for these reasons alone, I should regard the introduction of such a light, in this country, as one of the greatest calamities that could befall the rising generation. It is almost startling to think of the amount of blindness, or semi-blindness, which must result from light being improvidently intensified, within the short space of three-quarters of a century, in the ratio of 1 to 100. And yet this is what our electrical benefactors say they are prepared to do for us.

I am not so sanguine as your correspondent about the good sense of the public. (*Vide* Exeter!!) I think these things ought to be plainly set before them, and the introduction of electric lighting stoutly resisted or controlled. I have noticed with regret that the gas companies have somewhat connived at the injury of their own interests, in dealing faint-hearted praise in a somewhat over-conciliatory spirit. Thus, it has been repeatedly suggested, that the electric lighting companies might have the streets, and gas companies retain the domestic supply; &c.

This policy has been misunderstood, and, you will forgive me for saying, it is all nonsense; and, if I really believed that electric lighting would ever secure permanently the lighting of our streets, I should be silent. The reason that it could not, for one moment, maintain itself there is, that the lighting of streets affords, as you know well, the most unremunerative portion of a gas company's undertaking, and is not the real aim of the present electric light promoters, who feel they would be infallibly driven out of the field by the companies and corporations underselling them, with gas at from 2s. to 2s. 6d. per 1000, in the supply to public lamps. This would not imperil dividends or annuities in the least; and it is certainly in the cheap rates at which gas could be sold altogether, so long as coals rule at normal prices, that all interested in gas—and their name is legion—may confidently look for undisturbed security.

For my own part, and strong in these convictions, I shall venture to predict that confidence will soon be restored, that gas stocks will continue to rise, and that even the gas transfers of the future will yet be stoutly resisted by my valued and esteemed opponents, the gas companies.

ARTHUR SILVERTHORNE.

1, *Westminster Chambers, Victoria Street, Jan.* 9, 1879.

WEIGHTS AND MEASURES ACT, 1878.

SIR,—The Secretary of the Gas and Water Companies Association has favoured the readers of your JOURNAL with a long letter, replying to some questions which have been put to him, but which scarcely needed a lawyer's opinion; for if gas companies are using the weights and measures prescribed by the new Act, we do not want to be told that we can continue to do so, nor is it necessary to be informed that "over" measure or "over" weight will not render our transactions illegal.

In your issue of the 10th ult., you favoured me by inserting a letter of mine on this subject. No one has replied thereto.

How are we to measure a chaldron of coke under the new Act? that is the question. Thirty-six bushels make a chaldron, the chaldron being a multiple of the bushel. The measure must be of same shape and proportion as the standard bushel. A three-bushel sack is not a standard measure under the Act—*ergo*, a chaldron must be measured by the bushel, or by a measure containing 36 bushels, "the internal diameter of which must be double the internal depth." But, assuming that a sack of three bushels is considered a measure—it being "the multiple of a bushel"—then we are to measure a sack of coke in "a hollow cylinder, having a plane base, the internal diameter of which shall be double the internal depth."

The Secretary of the Gas and Water Companies Association, having had no experience in gas-works, may not see the difficulty of using such a shaped measure for serving coke customers, and filling their sacks from such a measure.

It occurs to me that the new Act cannot strictly be carried out by gas companies, and that a "sack" measure of a different shape to the "standard bushel measure" is wanted; in fact, the continuance of the present mode of measuring coke by the sack should be permitted.

Dover, Jan. 8, 1879. R. H. JONES.

THE USE OF GAS-ENGINES IN GAS-WORKS.

SIR,—In reply to Mr. Peaty's question in your JOURNAL of the 31st ult., as to how many gas-engines are employed in gas-works in England, I myself know of only three. One, a 3½-horse power Otto silent gas-engine, at the Hinckley Gas-Works; one, a 2-horse power atmospheric gas-engine, at the Redhill Gas-Works; and the third, a 1-horse power atmospheric gas-engine, at these works.

As to this question of Mr. Peaty's, I was surprised that Mr. Robert Wilson did not answer it in his letter published in the JOURNAL of the 7th inst., he (Mr. Wilson) being the representative of Messrs. Crossley Brothers.

Now, as to our own engine. I can speak with confidence as to its economy and efficiency. Being desirous to know the consumption of gas per hour by our engine, I put a new dry meter on to its service-pipe for a whole week, which extended from Friday night at six o'clock to the next Friday at the same time, and, on examination of the meter, I found the consumption was 1260 cubic feet, or at the rate of 7½ feet per hour. This consumption, I consider to be very satisfactory. Our engine has now been in constant use since Dec. 2, 1877, and is still doing its duty in as satisfactory a manner as possible. It is only stopped once a week, for about one hour, for cleaning purposes, and has not cost anything for repairs.

As I said before, it is a 1-horse power atmospheric gas-engine, and it drives one of Gwynne's 5300 feet per hour exhausters (its speed being regulated by Fison's patent apparatus), and two small plunger pumps with intermediate shafting, &c.; and, after doing all this work, we have fully one-half of its power to spare.

In conclusion, I think that gas-engines are far superior to steam power for gas engineers and others. They scarcely require any attention, and by their use one or more men can be dispensed with, not having any steam boiler or boilers to look after. By that means, a double economy is effected in wages and fuel; and, by using Fison's exhauster-regulating apparatus, the attention required in the engine and exhauster house is reduced to a minimum.

Andover, Jan. 9, 1879. HARRY WIMHURST.

SIR,—Mr. R. Wilson's remarks, in your last, do not reply to Mr. Peaty's inquiries as to the number of gas-works where the gas-engine has been adopted as a motive power in connection with the manufacture of gas. If I could have obtained the above information some 18 months ago, it would have been very useful to me, as I had the greatest difficulty in getting my Directors consent to having a gas-engine, and in

convincing them that it was the cheapest and most suitable working engine that could be used in gas-works.

The questions arose several times—Are there any gas companies who have adopted them? and where can we get the required information? The only place we could hear of, at that time, was in the small gas-works at Burley, in Yorkshire, where a 2-horse power engine was used by Mr. Fison, for driving an exhauster in connection with his self-regulating exhaust apparatus. Since then the Gas Companies at the following places have adopted them:—Andover, Harrogate, and Hinckley.

No doubt my experience with the gas-engine will be useful to your correspondent, and to many gas managers who are not using any motive power.

The first cost of a 3½-horse power silent gas-engine, an exhauster to pass 7500 cubic feet per hour, and one of Fison's self-regulating apparatus, was £314 16s. I commenced to work the whole on March 5, 1878, and from then up to the present time—a little over ten months—the apparatus has been running very satisfactorily. I have exhausted 12,500,000 cubic feet of gas, crushed over 250 tons of coke, and have pumped the liquor for the scrubbers and the water for the works, with a consumption of 124,000 cubic feet of gas, and, so far, not one penny has been paid for repairs.

I believe, too, with your correspondent, that if gas companies wish to encourage the use of gas-engines among their consumers, they should adopt them themselves. The example set here has proved a success. Two other engines have been purchased and fixed in this town, which would not have happened had we not led the way, and supplied the necessary information.

JOHN SUEL.

Hinckley, Jan. 9, 1879.

GAS COMPANIES AND THEIR CUSTOMERS.

SIR,—The directors of gas companies are gradually recognizing the fact, that it is worth while to obtain, as far as possible, the goodwill of each individual consumer. As vendors of a commodity, they should possess an intimate acquaintance with the various requirements of their customers, bearing in mind that the amount of business done, and, consequently, the profits earned, must depend directly upon the extent to which those requirements can be met or satisfied. As a rule, gas companies have experienced, year by year, a satisfactory increase of business, and this, combined with the apparent security of a monopoly, has in many cases produced a sort of self-satisfied *dolce far niente*, making it appear quite sufficient to keep pace with the demand, and inducing a disregard of the possibility of cheapening the commodity, either by reduction in price or improvement in quality, and without any exertion to bring it thoroughly before the notice of every person whose wants it may be calculated to supply.

This state of things obtains with many gas companies; but would any other body of merchants or tradesmen rest contentedly on their oars, lulled into laziness by a spontaneous increase of business, using no endeavours to make their commodity cheaper, better, and more popular, and allowing their representatives to rush as fast as possible from customer to customer? In the majority of cases the encouragement received from the public would have the contrary effect, and stimulate to further exertions. Perhaps this may be accounted for by the risk and uncertainty of competition from which gas companies have hitherto enjoyed an exceptional immunity; but it may not always be so. The monopoly is only protective in a limited degree, to the extent of the public value of the commodity, and is powerless against a cheaper or better substitute. Candles, lamps, and electric lights are being improved year by year, and gas companies should try to keep pace with them.

Bearing this in mind, and also reflecting upon the fact that men of education and ability are employed to push the sale of comparatively trifling articles—such, for instance, as maps and directories—it naturally occurs to me whether it would not be feasible and practicable to employ representatives in extending the use of gas—an article in constant demand, and capable of numerous applications. Gas companies would act judiciously, apart from pecuniary considerations, in adopting any course of action likely to extend their relations with the public. They might arrange that a representative should periodically call upon each customer, for the purpose of giving advice and information, and of pointing out the apparatus and appliances most suitable to each particular requirement. Opportunity would thus be afforded for bringing into prominence many of the less known applications of gas. Careful attention should be given to every complaint, the consumer being encouraged to make known his grievances, and the cause and remedy explained, if practicable. It is evident that such an official must have a thoroughly technical knowledge of the business, and also possess no small amount of tact and address. In large towns, such an individual must be specially engaged; but in the smaller places the duty might be undertaken by the manager, or perhaps by one of the directors. It would not be advisable, supposing it to be practicable, that the duty should be undertaken by meter inspectors or collectors. Through this official, the gas company would exhibit a friendly disposition and desire to be as useful as possible to their customers. This could not ultimately produce other than beneficial results.

By many consumers of gas, the visits of such an official as I have referred to would be gladly hailed as a boon. They are almost in the dark as to the best methods of using gas for any purpose, and greatly need intelligent advice. The visits of the meter inspector and the collector—the only officials of the company with whom the consumers come in contact—are too hurried to admit of information being obtained from them, and they must go to the gas-fitter—usually an ironmonger or a plumber, who undertakes gas-fitting work as an auxiliary trade, and whose knowledge of the subject is usually limited to matters of practical detail, such, for instance, as how to make a decent pipe-joint. Occasionally a person looks in who always encourages, if he does not create, dissatisfaction with the gas company—the itinerant vendor of burners or regulators. The writer has seen a printed circular issued by one of these individuals, in which the consumer is warned "not to listen to the specious representations of the companies *employés*, who are *interested* in inducing the consumers to *waste* as much gas as possible." Looking at the hurried, and, therefore, apparently off-handed manners of the companies representatives, together with the fact that gas-fitters, burner vendors, *et hoc genus homo*, invariably screen their blunders by attributing every defect to "the gas," can we wonder that erroneous notions and absurd prejudices have sprung up, which, in common fairness to the companies, apart from other considerations, should be removed.

The following facts might, amongst many others, be brought plainly before the customers:—

Gas companies are directly interested in securing to all parts of their district a sufficient supply of good gas, to be consumed, in every case, to the best advantage. If the light is dim, it does not necessarily follow (supposing such a process to be practicable) that the company are adulterating the gas. The meter is an independent machine, constructed by an independent maker, and certified by Government; and it cannot be manipulated to the advantage of the company, either by the inspector, or by any mysterious proceedings at the gas-works. The inspector, presumably honest, has nothing to do with primarily fixing the amount to be charged. Something might be done to induce the consumer to exercise more care as regards cleanliness. Lamps and candlesticks are always bright and clean; but, even in houses conspicuous for tidiness in all other respects, the chandeliers, gas-stoves, and fittings generally, from meter to burner, alike are dusty and dirty. When *savants* write to the papers an account of sulphate of copper they have scraped off their chandeliers, it would be interesting if they also stated the quantity of dust, dead insects, &c., that had accumulated in the ornamental cups, vases, &c., about the articles during the time occupied in the formation of the salt. Chandeliers and stoves alike have many chinks and crannies in which dust is allowed to accumulate, and the scorching of this rubbish, when the gas is lighted, has probably something to do with the "stuffy" kind of smell so often observable, and which leads many people to refrain from burning gas. Sometimes this is attributed to a "dryness of the air;" but it is rather mysterious how a gas-flame, giving off water as one of its products of combustion, can render air uncomfortably dry.

Although many of these points have been repeatedly brought before the public in lectures, pamphlets, and newspaper paragraphs, they can scarcely be said to have attracted popular attention.

CUM MULTIS ALIIS.

Parliamentary Intelligence.

GAS AND WATER BILLS, 1879.

Memorials, complaining of non-compliance with the Standing Orders in the cases of the following petitions for Bills, were deposited in the Private Bill Office before the 9th of January:—

Derby Improvement Bill, from Robert Dalby Dalby.

Manchester Corporation Water Bill, from Stanley Hughes Le Fleming.

Legal Intelligence.

DEVONPORT EPIPHANY SESSIONS.—SATURDAY, JAN. 4.

(*Before Mr.* T. H. COLE, M.P., *the Recorder, and a Bench of Magistrates.*)

PLYMOUTH DOCK (DEVONPORT) WATER-WORKS COMPANY *v.* THE CHURCHWARDENS AND OVERSEERS OF THE PARISH OF STOKE DAMEREL.

This was an appeal against a rate and assessment made upon the Water Company's property on the 2nd of November. There were several grounds of objection, and among them that the rate was not in the form required by law, that it did not contain a proper description of the property of the Company, that the sum of £2385 greatly exceeded the gross estimated rental of the property of the Company occupied by them in the parish, and that £1980 greatly exceeded the rateable value.

Mr. M'KELLAR appeared for the appellants; and Mr. ST. AUBYN for the respondents.

Mr. M'KELLAR said that, sooner or later, an important question would have to be determined between the Water Company and the Rating Authorities. It might be wise to quash the rate in dispute, but a new one would be made in a few weeks, and, if the respondents still continued their arbitrary action towards the Company, they would have to contest the matter. He then quoted extracts from a long correspondence between his clients and the respondents, and went on to explain that formerly the Company enjoyed absolute immunity from rating, but since the new Act had come into force they were no longer exempt. No proper determination had, however, been arrived at as to the amount at which the property was to be rated. At first it was set down at £500, which, it was understood, should hold good for a time only; but this year the gross estimated rental had been put down at £2385, and the rateable value at £1908. This fact alone afforded substantial grounds for instituting proceedings. In the new rate, which would be levied shortly, it was very probable that the Company's property would be rated right up to the source of the leat, and it was high time something should be done. He now applied for an order quashing the present rate, with costs. He should mention that it was the wish of the appellants to save as much expense in litigation as possible, and it would be far less expensive if his clients could start the appeal upon the new rate directly it was made. If the respondents would come to suitable terms now, there would be no need for entering another appeal at the next sessions.

Mr. ST. AUBYN said that as the application had been reduced to an order to quash the rate, with costs, he was instructed to offer no opposition; in fact, he consented to it. His clients wished to meet, and avoid litigation, and if the appellants would agree to some course whereby their books might be inspected, a great deal of litigation could be avoided.

Mr. M'KELLAR said he had suggested the alternative proposal of adopting the new rate and then appealing against it, in order to save expense. If the appeal were heard in London, before the Recorder, it would save much expense, especially as regarded surveyors and others, whose fees would be very heavy if brought to Devonport. The Recorder could give his decision at the next borough sessions.

The RECORDER said he was willing to assist counsel in every possible way.

Mr. M'KELLAR remarked that the quashing of a rate was a mere legal fiction.

The rate was then quashed by consent.

DEVONPORT GAS COMPANY *v.* THE OVERSEERS OF STOKE DAMEREL.

This was an appeal against the recent rating of the Gas Company's premises. Among the grounds of objection were that the rate was not in the form required by law, and that £3725 greatly exceeded the gross estimated

rental of the Company's property, and £2980 exceeded the rateable value.

Mr. CARTER, for the appellents, stated that it had been agreed to have the rate examined, and matters of importance considered, and he, therefore, asked for it to be quashed.

Mr. ST. AUBYN consented, on behalf of the respondents, and the rate was accordingiy quashed, the parties paying their own costs.

RICHMOND PETTY SESSIONS.—WEDNESDAY, JAN. 8.
(*Before Sir* H. W. PARKER, *Chairman, and a Bench of Magistrates.*)

SUPPLYING GAS TO A CLUB.

Mr. *Frederick Pope* appeared to answer an adjourned summons for non-payment of a sum of £3 15s., for gas supplied by the Richmond Gas Company to the County Residential Club during their tenancy of the club house on Richmond Green.

Mr. F. B. SENIOR again appeared for the Company, and produced a copy of the Company's Act of Parliament. He drew special attention to the 47th and 64th sections. By the 47th section, the Company were bound to supply gas to all persons making request in writing for the same, such being owners or occupiers having premises within 100 feet of their mains; provided always that the Company should not be liable to supply gas unless reasonable security be given for six months, the same to be given in writing. The 64th section enacted that all sums of money due to the Company might be recovered by distress.

Mr. *Giles*, the Collector, was called, and stated that application for gas was made by the Residential Club, through their Secretary, Mr. Taylor, on the 3rd of June, 1878. He produced the communications he had received from Mr. Pope in answer to applications for payment of their account.

Mr. SENIOR contended that the Company were on all fours with the Act of Parliament. First, they took the guarantee, and the amount was not paid within the time specified. The 64th section said that all sums of money due, or to become due, might be levied, by distress, by order of any justice before whom the application was made.

Mr. PENRHYN (Chairman of the Bench of Magistrates before whom the summons in the first instance was heard): Whom does the distress go upon?

Mr. SENIOR: Upon the person who owes the money.

Mr. PENRHYN: How are you going to prove that defendant is the person to whom the gas was supplied? Is he the owner or occupier of the premises?

Mr. SENIOR said if the Magistrate read further, he would find that it was provided that the Company should not be bound to supply gas unless reasonable security were given. If no provision authorized them to take a guarantee, then they should not be entitled to come to the Bench; but the Act authorized the guarantee, and did not say anything about consumers. The Company were authorized to take a reasonable security for payment, the reasonable security being the guarantee. He submitted that the words of the 64th section were perfectly clear. They meant all payments due to the Company under their Act.

Mr. PENRHYN: I should go entirely with you if you stopped short at the words, "all sums of money due may be levied by distress;" but it says due for the supply of gas.

Mr. SENIOR said the Company supplied other things besides gas; they supplied coke. But section 47 was peremptory. By it they were bound to supply gas; they were not bound to supply coke.

Mr. PENRHYN: You must prove that you have supplied gas to the defendant.

Mr. SENIOR: We are not bound to supply gas to the person who gives the guarantee, but to the premises.

Mr. PENRHYN: That is my point.

Mr. SENIOR: The Act says we are not bound to supply unless we have security; and, having obtained that security, what does it mean but that, at all events, the person who gives it is liable for it?

Mr. PENRHYN: He is liable in the County Court.

Mr. SENIOR said he must ask the Bench, if their decision was against him, to give him a case upon it, because it lay at the very root of the guarantee. It was quite true that they were not to be debarred from the County Court, and other remedies; but he submitted that the Company were entitled to come before the Bench upon the guarantee signed by defendant. He must ask for a case in point, if the Bench were against him.

Mr. PENRHYN: I think you are entitled to that.

Defendant: Do I understand that the summons is dismissed?

The CHAIRMAN: Yes.

Defendant: I have to ask for my costs.

Mr. PENRHYN: I think that is a most outrageous thing. The summons is only dismissed upon a legal quibble, and now you are asking for costs, after having admitted your liability.

The application was refused.

Miscellaneous News.

IMPORTANT EXPERIMENT IN STREET ILLUMINATION.

On Saturday evening last, a number of gentlemen were invited to witness the effect of an experiment in street illumination, which is now being made by the Phœnix Gas Company, under the direction of their Engineer, Mr. Corbet Woodall.

The district chosen for the purpose is a section of the Waterloo Road, extending from the south end of Waterloo Bridge to the terminus of the South-Western Railway Company—a distance of 500 yards. Hitherto this portion of the road has been very poorly lighted, and has had a somewhat dismal appearance, owing to the almost entire absence of any side light from shops, &c. The sanction of the Parish Authorities had been obtained by the Phœnix Company to carry out certain experimental changes at their own cost, and the result was seen on Saturday evening.

Briefly, the changes are as follows:—22 old street-lamps, giving a light of about 12 candles each, have been replaced by 48 new ones, with a light per lamp of 15 candles; the distance between the lamps has been reduced to one-third; the lamp-columns have been shortened by about 2 feet; and the usual iron frame in which the lanterns are carried has been abolished, the lantern now being fixed direct to the top of the column. The lantern itself has also been improved by the introduction of opal glass for the glazing of the roof. Owing to these last two changes, nearly all the shadow thrown by the common lamp has been got rid of.

At the bridge end of the road, two lamps on either side have been fitted with Mr. Sugg's new concentric ring Argand burners, each giving a light of 50 candles, enclosed in lanterns of a new and elegant shape. At about 250 yards from the bridge, the Waterloo Road is crossed by York Road and Stamford Street, and here there are placed two "sanctuaries" or "refuges." Up to the present time there has been in the middle of each of these "refuges" a lamp-column carrying three ordinary lights. These have now been replaced by columns carrying a new form of lantern, enclosing new Argand burners, one giving a light of 130 and the other 200 candles. In addition to these central lights, there are four others of 50-candle illuminating power, two being at each corner of York Road, and two at each corner of Stamford Street.

This experiment has been undertaken with a view to show that, with a generous use of gas, a road or street may be illuminated in such a manner that the light in any part of it shall be amply sufficient for all ordinary purposes, and the result of Saturday night's inspection showed that in the present case this has been fully accomplished. A newspaper could be read without difficulty in any part of the road, and the bright cheerful aspect of the thoroughfare thus lighted was very striking.

The cost of gas lighting, with all contingent expenses, according to the old plan, was 5½d. per hour per lamp; according to the new arrangement the cost is 17d. It is somewhat instructive to compare this with the lowest possible estimate of the electric light, if called upon to produce the same effect.

METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following report on the average daily quantity of water supplied to London during December, 1878. According to the returns furnished to him by the Metropolitan Water Companies, 130,086,702 gallons, or 591,043 cubic mètres, of water (equal to about as many *tuns* by measure, *tons* by weight) were supplied daily, or 235 gallons (106·8 decalitres), rather less than a *ton* by weight, to each house, and 33·1 gallons (15·0 decalitres) to each person, against 30·3 gallons during December, 1877.

COMPANIES.	Number of Houses, &c., supplied in Dec., 1877.	Number of Houses, &c., supplied in Dec., 1878.	Aver. Daily Supply of Water in Gallons* during Dec., 1877.	Aver. Daily Supply of Water in Gallons* during Dec., 1878.
Total supply	538,874	553,975	116,033,074	130,086,702
From Thames	254,179	262,210	57,804,383	64,893,002
„ Lea and other Sources	284,695	291,765	58,169,591	65,193,700
THAMES.				
Chelsea	28,859	29,438	7,622,200	7,531,400
West Middlesex	50,135	51,493	8,913,001	9,487,730
Southwark and Vauxhall	79,440	82,183	18,210,000	23,898,285
Grand Junction	37,910	38,989	10,713,682	11,222,887
Lambeth	57,835	60,107	12,405,500	12,752,700
LEA AND OTHER SOURCES.				
New River	126,071	127,673	26,073,000	25,961,000
East London	113,192	117,084	25,215,650	31,105,700
Kent	45,432	47,008	6,880,941	8,127,000

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for Dec., 1878, as compared with that for the corresponding month of 1877, shows an increase of 15,101 houses, and of 14,052,728 gallons of water supplied daily.

The following is Dr. Frankland's report on his analyses of the Metropolitan Water Supply during December, 1878:—

"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Companies, and by the Tottenham Local Board, was:—Tottenham, 1·2; Kent, 1·6; Colne Valley, 1·8; New River, 3·6; East London, 4·3; Chelsea, 4·8; Lambeth, 5·3; West Middlesex, 5·7; Southwark, 6·3; Grand Junction, 7·8. The water abstracted from the Thames by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was still more polluted by organic matter than in November, and the water delivered by the Grand Junction Company was inefficiently filtered, and contained moving organisms. The water drawn from the River Lea by the New River and East London Companies was efficiently filtered, but it was polluted by organic matter, though to a less extent than the water abstracted from the Thames. The water supplied by the Kent and Colne Valley Companies, and by the Tottenham Local Board, was clear and of its usual excellent quality for dietetic purposes. The Colne Valley water was soft, and, therefore, fit for washing. Seen through a stratum two feet deep, the waters presented the following appearances:—Kent, Colne Valley, and Tottenham, clear and colourless; East London and New River, very pale yellow; Chelsea, West Middlesex, and Lambeth, pale yellow; Southwark, yellow; Grand Junction, yellow and slightly turbid."

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Matters.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen, as Nitrates and Nitrites.	Total combined Nitrogen.	Chlorine.	Total Hardness.
Inner Circle.								
Thames—								
Chelsea	32·20	·256	·031	0	·222	·253	1·5	21·2
West Middlesex	31·66	·291	·048	0	·197	·245	1·5	21·5
Southwark	31·10	·329	·043	0	·203	·246	1·6	20·6
Grand Junction	31·00	·415	·046	0	·189	·235	1·6	21·2
Lambeth	32·40	·282	·036	0	·390	·425	1·5	22·1
Other Sources—								
New River	31·08	·183	·029	0	·265	·294	1·5	21·8
East London	32·60	·229	·028	0	·158	·186	1·8	22·4
Kent	44·70	·077	·018	0	·407	·425	2·5	29·6
Outer Circle.								
Colne Valley	15·40	·094	·012	·004	·220	·235	1·4	7·4
Tottenham Local Board	47·66	·059	·014	0	·399	·413	3·3	25·7
Corporation of Birmingham*	27·80	·374	·047	·003	·330	·379	2·0	19·2
Corporation of Glasgow†	2·90	·171	·011	·000	·006	·017	0·60	1·35

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
† Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

DERBY GAS COMPANY.—Last Tuesday a special general meeting of this Company was held—Mr. G. Gascoyne in the chair—for the purpose of authorizing the allotment by the Directors of 800 seven per cent. shares. The Chairman referred to the sound and satisfactory condition of the Company, and to the exceptionally low price at which gas was supplied to consumers, the Sanitary Authority being supplied at 2s. 4d. per 1000 feet. After a protracted discussion on some minor points, a resolution was unanimously adopted authorizing the allotment of the shares to the present proprietary, in the proportion of one share to every registered holder of six shares.

THE PLYMOUTH TOWN COUNCIL AND THE GAS COMPANY'S BILL.

A Special Meeting of the Plymouth Town Council was held last Wednesday—the Mayor (Mr. E. James) presiding—for the purpose of considering the provisions of "A Bill for enlarging the powers of the Plymouth and Stonehouse Gaslight and Coke Company, and for other purposes."

Mr. Morrish, Chairman of the Gas Committee, said that the Committee had considered the Bill of the Gas Company by means of a Sub-Committee. The Sub-Committee had reported to the Committee, but there was no formal report before the Council. As, however, the report of the Sub-Committee was in concise form, he thought the Council would prefer that the Town Clerk should read it.

The Town Clerk (Mr. W. Wilson) then read the following report of the Gas Sub-Committee:—

The Company base their application for a new Act on two grounds:—1. That it would be for the public advantage if the operations of the Company were extended, and they were empowered to combine, with the manufacture and supply of gas, the production, manufacture, and supply of electric light, or other illuminating power. 2. That it is expedient that the capital of the Company should be increased. Your Committee are, however, of opinion that neither of these grounds can be made good, and that it will be most distinctly to the disadvantage of the public that extended powers should be granted to the Company, and most inexpedient that they should be authorized to raise additional capital. It seems questionable to which of the two objects contemplated by the Bill the Company attach the more importance; but, on the part of the consumer, each is open to serious objection.

To deal with the objects in the order they are mentioned in the preamble:—

1. As to the application for leave to produce and supply electric light or other illuminating power, your Committee think that the application is altogether premature, and this will appear when it is seen that the Company do not propose any specific method of producing or supplying electric light, which has been ascertained to be practicable. It is evident that they know of none, for they ask to be at liberty to make such trials and experiments as they may think fit, with a view of determining hereafter as to the efficiency or applicability or method of production and supply with the view of producing and supplying the electric light. The Company ask also to be at liberty to acquire any patent rights and licences they please—a power which your Committee think should on no account be granted to them at present. It would enable the Company from time to time to expend large sums on the purchase of property, which, a short time after it is bought, may altogether be superseded by new inventions, and become comparatively useless, and thus impose on the consumers, to no purpose, a very heavy charge, which they would have no power to prevent. Should, however, the Company be so well advised as to purchase at the outset the best patent or licence for the production and supply of electric light, the effect would be to secure to them the absolute monopoly of its use. They would be at liberty to demand their own price, and to supply light of such quality only as they should see fit, and the Sanitary Authority would themselves be altogether precluded from making arrangements with patentees, which might be much more beneficial to the public—an event which should not be possible. It should be borne in mind also, that to entrust the undertakers with unlimited powers of this character would be to introduce an entirely new principle into a gas company's Act, and make the interest of the consumers entirely subordinate to that of the shareholders. If the Company are considered entitled to what they are applying for, it should be granted only with restrictions and conditions similar in principle to those contained in their Act of 1855—viz., that proper illuminating power be ensured to the consumer, and at a cost of which the maximum should be fixed by the Act. But as neither of these requirements can at present be complied with, because neither the cost of production nor the illuminating power of the electric light is ascertainable, your Committee consider that the time has not arrived for the Company to make the application contained in their Bill. If, however, the application should be persisted in, and it is seen that there is an inclination on the part of the Legislature to confer the power applied for, then your Committee would advise that the endeavour be made to introduce a clause in the Bill, enabling the Company to exercise this power in one event only—viz., in case they shall first obtain the sanction of the Sanitary Authority. The power to make experiments and trials should be entirely expunged from the Bill. The application for leave to introduce any other illuminating power would, if granted, confer on the Company a power so comprehensive and unlimited—enabling them, as it would, to adopt from time to time any fanciful description of light they may think fit, without any reference whatever to the consumers, except when the cost incurred had to be defrayed—as to be absolutely dangerous to the public interest. The words seem introduced only in order that they may be struck out.

2. As to the application for additional capital:—The Bill states that it is expedient that the capital should be increased, and it empowers the Company to raise £60,000 additional share capital, to borrow £15,000, and to increase their reserve-fund by £6000 The question arises, is this proposal expedient?

The actual capital at present called up is	£85,000	0	0
Capital created out of revenue from the formation of the Company to Midsummer, 1878, and expended in extensions of works, as distinguished from repairs, about	52,000	0	0
Share capital not called up and still available	10,000	0	0
	£147,000	0	0

The last annual statement of the Company shows that they had then available, to meet ordinary and extraordinary claims, no less than £35,000. It is made up as follows:—

Debts due	£12,310	8	0
Coals in store	2,010	19	6
Railway debenture (*i.e.*, the reserve-fund)	6,500	0	0
Cash at Bankers	9,751	8	0
	£30,572	15	6
Deduct outstanding liabilities, £1795 17s. 1d., and one year's dividend, £3500	5,295	17	1
	£25,276	18	5
And uncalled-up capital	10,000	0	0
	£35,276	18	5

It also shows that, after meeting the year's expenses, including—

Renewals and repairs	£1,097	10	8
Extensions, referred to in the account as the depreciation of plant	1,500	0	0
Addition to a new fund, called a "contingent-fund," created in 1877	1,500	0	0
And dividends	7,000	0	0

there was then an excess of profits for the year, beyond expenditure, amounting to about £800. Such figures as these do not, of themselves, show the necessity for additional capital for the ordinary purposes of the Company. The fact that the Company have still £10,000 uncalled-up capital is almost conclusive on the point. Nor is it believed that additional capital is needed on account of the "extended operations" of the Company, as stated in the preamble; for although the town has been steadily increasing, yet the Company have year by year provided for this extension by making a capital expenditure out of profits, and what they have done in the past, it may be open to them to do in the future. In illustration of what the Company can do out of revenue, attention is called to the fact that, in the years 1875 and 1876, no less than £8000 was expended by them for new retort-houses.

With these accounts before them, the Committee are at a loss to discover how additional share capital could be utilized for the ordinary purposes of the Company, in the interests of the consumers, and from what has been already said, your Committee do not consider that any case can be made out for an increase of capital for the purpose of enabling the Company to produce and supply electric light or any other illuminating power.

But it is inexpedient that the Company should have additional capital on the terms asked for, independently of the question whether or not it is expedient that they should have the capital itself. The application is for a capital of £60,000, to carry a maximum dividend of 7½ per cent., which would enable the Company to make out of profits an addition to the reserve-fund of £6000. Your Committee consider that this application would throw much too heavy a burden on the consumers, and that it should be most strenuously opposed; that the Company are not entitled to such a rate of dividend, now that the undertaking is such a thorough commercial success, and that it has ceased to bear anything of a speculative character. If additional capital is granted, it should be of much less amount, and should carry a maximum dividend of not more than 5 per cent. But your Committee would suggest that if the Company make out a case for additional capital it should be granted to them only in the form of a borrowing power, to carry, say, 4½ per cent. At the present time the undertaking of the Company is entirely unencumbered, and, therefore, there can be no objection to the creation of a very considerable borrowing power. On plant worth, say, £100,000, there would be no difficulty in raising £25,000 on mortgage. There may be reasons why the Company should be desirous of raising an additional share capital of £60,000, which would carry 7½ per cent. in the form of dividend, and would be apportioned among the present shareholders at par. The interests of the shareholders unmistakeably would prompt the application; but, in the present case, the interests of consumers and shareholders would seem to be antagonistic. The former would have to bear the burden in the shape of the increased price of gas, or, at the least, in the postponement of a reduction of the price of gas, for the benefit of the latter. The Company were distinctly formed in the interest of consumers, and it is their interest which will have to be specially considered and protected before the Bill can become law.

In Committee, the opportunity will be afforded the Sanitary Authority to propose the introduction of the following, among the other provisions, which seemed call for:—1. Some more stringent regulations with reference to the repair of injury to streets. 2. The reduction of the maximum price of gas from 6s., as now fixed, to say 3s. 3. An alteration in the minimum illuminating power of gas, which is 16 candles, to say 20. 4. A reduction in the maximum price to be charged for the supply of gas for public lamps.

It will be seen, from what has been already said, that to pass the Bill in its present shape would be to place great powers in the hands of the Company—powers which are at present unnecessary, and which may be exercised largely in the interest of shareholders, and greatly to the disadvantage of consumers. Your Committee consider that the Company will have great difficulty in making out their preamble, and that the proper course to take, with reference to the application, is to oppose the Bill in Parliament, with a view to its total rejection, or the introduction of such modifying clauses as have been above suggested, and as may be advised by Counsel to be consulted on behalf of the Sanitary Authority.

Mr. Morrish moved—"That inasmuch as, in the opinion of this Council, the Bill for an intended Act for which the Plymouth and Stonehouse Gaslight and Coke Company have given notice of their intention to apply to Parliament for in the ensuing session, intituled 'A Bill for enlarging the powers of the Plymouth and Stonehouse Gaslight and Coke Company, and for other purposes, would, if passed, injuriously affect the interests of the inhabitants of the borough of Plymouth, the Council do oppose the said Bill in Parliament, with a view to its being thrown out, or to the introduction of proper clauses therein for the protection of the interests of the said inhabitants; and that the costs, charges, and expenses of this Council, incurred in opposing the Bill or in relation thereto, be charged on the local rates levied by the Council," He said it was necessary the Council should that day decide whether they would oppose the Bill or not. The Bill was before Parliament, and opposition or otherwise must be decided on within a few days. Taken popularly, the Gas Company were asking for powers to apply the electric light; but the Committee were rather inclined to think it was not the application of the electric light, but the proposal to enlarge the Company's capital, which was the most important part of the Bill. They sought this latter power from the Board of Trade some years since, when an inquiry was held by Colonel Rich, with the result that they did not make out their case. It would be very much indeed to the disadvantage of the town that the Company should have the powers they sought according to the preamble of their Bill. The Company were already under certain restrictions, and properly so, as they had a monopoly of the supply of light to the town. The payment by the Corporation to the Company was shown in their last balance-sheet to be equal to a 5½d. rate; and would any gentleman—knowing the amount of dividend the Company could pay on their capital, and that the surplus ought to go to the reduction of the price—say that they should have power, at this early stage of the electric light, to combine experiments with that light with the manufacture of gas, to raise more capital, and to spend money in experiments, every sixpence of which would have to come out of the pockets of the consumers of gas, and not out of the pockets of the shareholders of the Company? To trade in the electric light, which was still in its infancy, was a most speculative proposal. He maintained that the Directors were bound to consider the interests of the consumers as well as to look after their own interest, and they had no right to spend money, which ought to go to the reduction of the price of gas, in such a speculative article as the electric light. With reference to the application for powers to raise additional capital, he might say, without fear of contradiction, that he knew of no company and no association for trade, within a circuit of some hundreds of miles, whose position was more stable and flourishing, and he might also say more flush of funds, than the Plymouth and Stonehouse Gas Company, and of no company or association which was in so little need of additional capital. He found by the balance-sheets of the Company that they had surpluses of something like £12,000, £18,000, £27,000, and £28,000. They had, above that, a reserve-fund of £7000 in round figures; while their liabilities were £1800. They had a working capital of from £20,000 to £25,000. He found that their trade requirements—all the money they wanted to expend in one year—were £36,000 for coal, and £16,000 for wages and ordinary charges; and, on the other hand, they received a rental for the gas of £37,000, and for residuals £15,000. The Company, during 1877 and 1878, spent £8000 upon a new retort-house, and in the last two balance-sheets they set aside £2000 in 1877 for depreciation, and £1500 in 1878. They also set aside £2000 in 1877, and £1500 in 1878, on account of the contingent-fund. In this way they put away the money which, he contended, ought to go into the consumers pockets; and the obtaining of the Bill would mean that the price of gas for every one should not be gradually reduced, as it must be if the capital of the Company were confined to its present limits.

Mr. Latimer seconded the motion. He said he felt that the Council, as a public body, were fully justified, and, in fact, required, in the due performance of their duty, to go before Parliament and oppose any granting of additional powers to the Gas Company for increasing their capital. They had a great interest in this matter, as consumers of gas and as ratepayers of a town expending nearly £4000 a year in public lights. They, of course, would all admit the very admirable way in which the operations of the Company had been conducted; but they had a public duty to perform in ridding the public of what would be a permanent charge if the proposals contained in the Bill were carried out.

Mr. S. Stevens thought the two last speakers had made a little mistake in saying that the Corporation paid the Company £4000. Last year he found it was only £2693 16s. 4d. He admitted that the Company had several thousand pounds in reserve-funds, and that there was no occasion for increasing their capital; but they only charged 2s. 3d. per 1000 feet for gas—the lowest price in the kingdom.

Mr. Pethick asked what would be the cost of opposing the Bill.

The Town Clerk: One can only say approximately. The cost of opposing the Devonport Water Company's Bill was about £1000; but I do not apprehend this would cost anything like that sum. The chief amount, I suppose, would be for Counsel's fees.

Mr. Morrish said he found Mr. Stevens was right as to the cost of the public lights. In the Company's accounts, from which the Committee took their figures, it might be that they included Stonehouse. The cost to Plymouth was about £3000, or a 4½d. or 5d. rate.

Mr. T. J. Stevens thought that before the Council went to war with the Company they should endeavour to obtain what they wanted by negotiations. They were much indebted to the Directors of the Gas Company for their able management, and they deserved a better fate than to be met by immediate opposition. If they watched the newspapers, they

would find that similar applications to that of the Plymouth Gas Company were being made by gas companies throughout the country. As to whether they asked for too much money or too little, that was a matter more for the Shareholders of the Company than for the Council. He therefore proposed, as an amendment—"That the Gas Committee of the Corporation be authorized to confer with the Plymouth Gas Company, and endeavour to obtain what, in the opinion of the Gas Committee, is necessary for the protection of the public interest."

No support was, however, given to this amendment; and, on the motion being put to the vote, it was carried by 25 to 1.

Mr. PITTS then proposed that the Gas Committee be authorized to give effect to the resolution, and suggested that they should endeavour to come to some arrangement.

Mr. ROACH seconded the resolution, hoping that an amicable settlement would be come to.

The meeting then ended.

THE EXETER CORPORATION GAS BILL.

At the Meeting of the Exeter Town Council, last Wednesday—the MAYOR (Mr. W. H. Ellis) presiding—the Parliamentary Committee presented the following report:—

It is with great regret that your Committee have to report that the result of the recent poll of owners and ratepayers in reference to the proposed purchase of the Gas Company's undertaking, and for other purposes, has resulted in the refusal of such owners and ratepayers to consent to the promotion of the Bill, by 4426 to 1018 votes. It is true that such a vote does not necessarily prevent the Council from proceeding with the Bill; it only prevents their charging the cost of its promotion upon the rates. But probably the Council will accept so decided an expression of opinion as evidence of a very general feeling against the acquisition of the Company's undertaking, and will adopt the recommendation which your Committee now make, to proceed no further with their Bill, so far as that matter is concerned.

But the Bill which your Committee had prepared contains other and valuable provisions in reference to sanitary matters; and having regard to the stage which has been reached, they are strongly of opinion that this part of the Bill, which is to confer powers which the Council, as a Sanitary Authority, have long felt the need of, and must, sooner or later, seek to obtain, should be proceeded with. Shortly stated, the Bill would empower the Council to require notice from the medical attendant, or other person having the care or charge of a patient suffering from certain infectious disorders which are apt to take an epidemic form, timely notice of the appearance of the disease, whereby effectual measures may forthwith be taken to prevent it from spreading. It would enable the Council to declare to be unfit for human habitation buildings which they were satisfied were in that condition; and would authorize them thereupon, if need be, to purchase such buildings for the purpose, either for taking them down—the only way, that is, in a sanitary point of view, of dealing with such habitations—or of causing them to be rendered fit for human dwellings. And it would furnish the natural complement to the building bye-laws, by authorizing the Council to reqnire that the completion of all new buildings intended for human habitation, so far as the requirements of the existing bye-laws as to the stability, drainage, ventilation, and protection against fire are concerned, should be certified by the City Surveyor, before such buildings could be permitted to be inhabited.

The immense importance of the first of these provisions—viz., as to giving notice to the Sanitary Authority of the occurrence of a case of infectious or contagious disease—can hardly be overstated. It is one the Council have long desired to have; and there are not wanting instances, in the experience of the Sanitary Committee, where timely casual notice has enabled the Medical Officer and the Sanitary Inspector to confine a contagious disorder to the house in which it occurred, and thus to prevent its becoming epidemic; and it is not too much to say that, if the Council were possessed of the power they seek to obtain, many hundreds of pounds would be saved to the rates of the city. The power in question was first granted by Parliament three years ago to the Corporation of Bolton, and has since been conferred on several other Sanitary Authorities.

The Bill also contains clauses in regard to the water supply, which the Committee deem of some importance; and they recommend that, with the exception of the proposed increase in the charge for water, these clauses, which are to regulate and facilitate the supply of water by meter, be proceeded with.

When the Corporation Water Bill of last session was passing through Parliament, the Committee in charge of the Bill—who had then, of course, no acquaintance with the business of the Company, and it may be remembered that such members of the Council as were connected with the Water Company were, for an obvious reason, expressly excluded from the Committee—were of opinion that it would be better to charge for water by a pound rate than according to the scale of the Company, and they fixed 5 per cent. as the maximum of such rate. Your Committee had intended, as the Council are aware, to have applied to Parliament to sanction an increase in the rate for water, so as to have enabled the Council to charge according to what they find to be the usual rate in other towns of similar size; but having regard to the labours of the Assessment Committee, whereby the assessable value of the city is likely to be considerably enhanced, and, consequently, a better income may be expected to be produced by the 5 per cent. rate, your Committee recommend that no increase be made in the scale, with the exception that they propose to adopt the minimum of 2d. per week, which is fixed by the Public Health Act.

Alderman THOMAS moved that the report be received and adopted, and inasmuch as the owners and ratepayers of the city had, on a poll, refused to sanction the purchase of the gas-works, no further steps be taken, and proceedings in Parliament be abandoned. He said the report, as they had heard, dealt with two other matters besides the question of gas supply, and after the report issued by the Corporation of the Poor, on the sanitary condition of the city, he thought no one would hesitate to give the Council the powers asked for with regard to sanitary and other matters, which powers almost every other city, where the Council acted as the Sanitary Authority, had. With regard to the water supply, he would observe that it was proposed that the minimum charge should be 2d. per week, which would be 8s. 8d. per year. The minimum charge granted to the late Water Company was 10s., so that the poor would benefit in that way by the transfer of the works to the Council. He need say very little with regard to the proposition as to the gas-works, for it had been discussed very fully by the Council, and it had been discussed very fully and unfairly outside the Council; but, of course, they all felt that they must bow to the opinions of the citizens. They would remember that in the few remarks he made at the meeting of ratepayers, and also at the Council meeting, he said that whatever course was adopted by the city generally they were bound to carry out. The Council had never any other intention, and they had no other object in going to the city. He could only regret that the city should have been misled, for he believed they had lost an opportunity of making a reduction of the rates, which would have been made by the acquisition of the works by the Council, and they had lost the advantage of having, in their own hands, works which might be made an advantage or a great nuisance to the city.

Alderman BUCKINGHAM, in seconding the resolution, said that though, no doubt, every member of the Council had made up his mind as to the result, it was their duty to assent to the decision of the citizens, as arrived at by the poll. Whatever the loss might be, it was the citizen's own doing, and they must abide by it. For his part, he had no doubt that the grounds on which the Council came to the conclusion they did were wise and judicious. With regard to the gas question, he could only say that the matter was discussed for years; resolutions were passed time after time; and at one period he certainly took a part antagonistic to the proposal to purchase, as he did not think it advisable. Still, it then appeared to be the desire of the citizens at large. The Council accordingly proceeded to send a Committee to London, and he did not see how any one member of it could consent to give up the contract they made with the assent of the Council, and, as he believed, of the city. And not only that, but the men appointed by the Council to represent them in London were men of business habits and intelligence, and had the best opportunities of getting information from scientific men, parliamentary agents, and counsel; and from those persons they gathered opinions which they believed would lead them to sound conclusions. Certainly, there was very much information given them in London, which greatly altered their opinion of what was so much talked of—viz., the electric light; and the opinion given them by scientific men engaged on behalf of the Council, had been amply confirmed by the reports of scientific societies up to the present. The conclusion the Committee came to was, that, if they concluded the purchase, they would get all their money back again before the electric light came into general use. He himself did not think so at first, but he was persuaded that it was true by the opinion of men much better able to judge than the Committee were. He had since been in communication on the subject with persons in large towns in the North of England, and was confirmed in the opinion he had formed, in consequence of the investigations of the Committee. Therefore, having, as he believed, behind him the opinions of the citizens at large, and certainly of the Council, and having the opinion of men so able to give an opinion, and who considered it advisable to purchase, he felt he could not go back. He was sure they were all actuated by a desire to do what was best for the city, and, perhaps, now they would hear no more about the matter until they were informed that the Gas Company were making large profits.

Mr. EDWARDS asked, with regard to the water supply, whether the charges would be raised. He did not think they should be raised, as they were high enough already.

The TOWN CLERK said the Committee originally proposed some such scale as was in use in places of a similar size, in order to produce a better income than the 5 per cent. would produce; but they had decided to abandon that scheme, as they expected that the new assessment would produce a larger amount. There would, therefore, be no increase in the charges.

Mr. EDWARDS: But there will be an increase in the assessment?

The TOWN CLERK: We cannot help that.

Mr. WILLEY said, with regard to the Gas Company, he should like to see some recognition of their courtesy to the Committee in allowing their books to be inspected, and preparing a report.

Alderman DAW said they had a very long and important report of the Parliamentary Committee before them, and he would propose, as an amendment, that it be printed and circulated, and a special meeting of the Council called to consider it. If the proposal to give the Local Authority new powers to deal with infectious diseases was a good one, Government ought to take it up and extend it to other towns. No doubt proper representations would induce them to do so, and in that case the city would be saved the expense of a separate application to Parliament. With regard to the latter clause, it was quite clear that they would have to deal with it, and it would be necessary before long to go to Parliament to raise capital in connection with the water supply, and then both matters might be included in one Bill.

Mr. ANDREW seconded the amendment.

Alderman DAW said that at one of the public meetings certain persons thought that only one portion of the Bill went before the ratepayers; but, as a fact, the whole of it went before them. Now, as the whole Bill was, in point of law, voted against, could the Council legally go on with it or any part?

The TOWN CLERK: Certainly. But, first of all, there must be a meeting of the Council to decide if they will proceed with the Bill. The resolution to proceed will have to be carried by an absolute majority of the whole Council, and then the owners and ratepayers will have to be asked if they consent to the promotion of the Bill.

Alderman THOMAS, as the mover of the resolution in its present form, would point out that the Council would have to confirm it at a subsequent meeting. He would suggest that Mr. Daw's object would be attained by having the report printed and circulated in the meantime; and he, therefore, proposed to meet matters by dividing the motion. He thought they would be unanimous that the Council at that meeting should confirm the principle laid down by the citizens, that the portion of the Bill referring to the purchase of the gas-works must he dropped. If that was put as a separate resolution, the Council might dispose of it at once, and divide on the matter. He submitted his proposition in the following terms:—"That inasmuch as the owners of property and ratepayers of this city have, on a poll taken, refused to consent to the promotion of the Bill to authorize the purchase of the works and undertaking of the Exeter Gaslight and Coke Company by this Corporation, no further steps be taken towards the completion of the purchase."

Alderman BUCKINGHAM seconded this motion, and it was carried unanimously.

Alderman DAW then moved, as an amendment to the motion for the adoption of the report, that so much of the report as related to the proceedings to obtain the sanction of Parliament to the Bill be received, printed, and circulated among the members of the Council, and considered at a future meeting.

Mr. ANDREW seconded this amendment.

On the question being put, there were 9 for the amendment and 13 against. The amendment being lost, the motion for the adoption of the remainder of the Parliamentary Committee's report was carried, 15 voting for it.

Alderman DAW gave notice that at a future meeting of the Council he should move that the resolution now come to be rescinded.

At a later part of the proceedings,

The TOWN CLERK stated that he had received a letter from Mr. W. A. Padfield, the Secretary to the Gas Company, asking whether the Council would be prepared to make them any further advance, and pointing out the great difficulty in which they were now placed. The fact was, that while the Company had been waiting for the Council, they had deferred raising capital, and were placed in a very serious position, as they could raise no money without giving three months previous notice, which notice had been given by the Company to the Stock Exchange Committee in London. In reply to a question, he said the Company had already borrowed of the Council £5000, at 5 per cent. interest.

Alderman THOMAS said the present position of the Company was entirely owing to the action the Council had taken. But for that action, they would have raised their £20,000, £30,000, or £40,000 long before this time; but it so happened that the financial position of the Company was in a state of disturbance, and it would be unfair of the Council to force them into the market now, and oblige them to borrow money at a high rate of interest. The Company were perfectly ready to pay a fair rate, so that they should not be losers, and he thought the Council should be authorized to advance a further sum of £10,000 for twelve months.

Mr. HUXTABLE expressed his surprise that the Town Council should become money-lenders.

The TOWN CLERK said they were not applied to on grounds of strict legality; they were asked to assist the Company, whom they had put in difficulties by their action.

Alderman THOMAS moved to refer the matter to the Finance Committee, to report to the next meeting, whether as an ordinary Council or as the Sanitary Authority.

This proposition was seconded by Mr. WILLEY, and unanimously carried.

BILSTON GASLIGHT AND COKE COMPANY.

The Annual General Meeting of this Company was held on Monday, the 6th inst.—Mr. W. Hatton in the chair.

The Secretary and Manager (Mr. J. S. Reeves) read the notice convening the meeting, and the following report was submitted:—

The Directors herewith present to the Shareholders their thirty-third annual report, together with statement of accounts.

The trade account shows a profit of £3216 14s. 4d., which with £1901 18s. 3d., brought from last year's account, makes a total of £5118 12s. 7d.

The Directors propose to appropriate this amount as follows:—

Half year's dividend of 4s. per share paid Aug. 1, 1878	£1400	0	0
Half year's dividend, payable Feb. 1, 1879	1400	0	0
One year's interest on debentures	296	5	0
To reserve-fund	200	0	0
Carry forward to next year's account	1822	7	7
Total	£5118	12	7

The Directors have pleasure in being able to present a favourable report of the past year's operations.

The new works having approached completion, the manufacturing portion of the Company's business has been transferred from Moxley. New and commodious offices are in course of erection, and the Directors will shortly transfer the office department to their new premises.

A portion of the apparatus at the Moxley works has been disposed of, and the amount received has been applied in reduction of the works account. The land and premises at Moxley are now on sale.

The Directors consider that the advantages afforded by the new works, together with the reduced rates for coal, will enable them now to declare a further reduction in the price of gas, and this concession they believe can be made without prejudicing the interests of the Shareholders.

The erection of the works having cost more than was estimated, the extra funds have been provided for by a temporary advance from the Company's Bankers. To meet this liability, your Directors propose to issue debentures to the amount of £5000, to bear interest at the rate of 6 per cent. per annum, and at the close of the general business the Shareholders meeting will be made an extraordinary one, for the purpose of considering, and, if approved, adopting, a resolution authorizing this. If authorized, the Directors will, in the allotment of the debentures, give preference to those Shareholders who may apply for them. Of this, due notice will be given.

The Directors who retire by rotation are Messrs. W. Hatton, E. Price, and R. H. Kearnes; they are eligible, and offer themselves for re-election.

The Auditors, Messrs. T. S. Hatton and E. Ellis, also retire, and offer themselves for re-election.

Dr. *Trade Account for the Year ending Sept. 30, 1878.* Cr.

Value of stock, Sept. 30, 1877.	£153	10	0	Gas and meter rent	£9,658	4 4
Coal	5,791	14	10	Residual products	4,893	3 10
Mains	286	14	0	Sundries	1,693	9 9
Meters	396	3	5	Stock	284	0 0
Sundries	969	10	4	Amount expended for materials and wages, on plant and on extensions, carried to new works account.	3,221	16 9
Materials and machinery for new works	2,430	6	3			
Sale of old materials, transferred to works account	775	0	0			
Wages	3,451	3	0			
Salaries, Directors fees, &c.	710	0	0			
Rates and taxes	467	14	10			
General charges	313	19	4			
Abatements	228	4	4			
Amount written off works account for deterioration	560	0	0			
Balance profit, carried to profit and loss account	3,216	14	4			
	£19,750	14	8		£19,750	14 8

The Chairman said he had little to add to the report. The Directors were pleased that, notwithstanding the very severe depression of trade that had prevailed over the district, they had been able to obtain profits within a few pounds as great as those of the previous year. This was not due to an increased charge for gas, but rather to increased consumption. They had, to a small extent, realized some of the advantages of their new works, for, notwithstanding the expense involved by the removal of the works from Moxley to Millfields, and the maintenance for some time of both establishments, they had been able to make an exceedingly satisfactory profit. Owing to the greatly increased facilities which their new works had given them to receive coal at a moderate cost, thus saving them a considerable sum in haulage, and owing also to the improved methods of distributing gas all over the district, whereby there had been a great decrease of leakage, and, consequently, an increase of profit, the Directors were able to present a very favourable financial statement. There had been an increase in the actual quantity of gas sold; for, while in 1877 the quantity sold was 52 millions, in 1878 it reached 53 millions. There had been a steady increase for years all over the district, as might be seen when he told them that in 1869 the annual consumption amounted to only 34 millions. This progress of demand had enabled the Directors from time to time to make reductions in price, which was now at a very moderate rate—more moderate, with the reduction lately announced, than in many adjoining towns. The largest consumers were paying 2s. 9d. per 1000 feet, and the smallest 3s. 3d. The Directors relied upon a still larger consumption to reimburse them for the concessions which had been made, and for the outlay which had put them in a position to supply the district more fully and efficiently, and at less cost, with gas. With regard to the electric light, he did not apprehend that gas companies had much to fear from it. However beautiful and scientifically interesting it might be, he did not think it likely to be adopted in ordinary business and for domestic purposes. He was confirmed in this view by the action taken by several public bodies since the electric light had been brought into prominent notice. He concluded by moving the adoption of the report.

Mr. Holcroft seconded the motion, which was agreed to.

On the motion of Mr. Thompson, it was resolved that a dividend of 4s. per share be paid on Feb. 1, for the half year ending Sept. 30 last, in addition to the similar dividend which was paid for the first half of the year on Aug. 1, 1878.

The retiring Directors and Auditors were re-elected, and thanked for their services.

The Secretary and Manager was also thanked for his attention to the interests of the Company.

The meeting afterwards resolved itself into an extraordinary one, for the purpose of considering the question of issuing the debentures referred to in the report, and a resolution authorizing the issue of 100 debentures of £50 each was approved.

THE MANCHESTER CITY COUNCIL AND THE THIRLMERE SCHEME.

The Monthly Meeting of the Manchester City Council was held last Wednesday—the Mayor (Alderman Grundy) presiding. At noon, the meeting was made special, for the purpose of considering the propriety of promoting a Bill in Parliament to enable the Corporation to obtain water from Lake Thirlmere, the costs incidental thereto to be defrayed out of the public funds.

Alderman Grave (Chairman of the Water-Works Committee) moved the formal resolution empowering the Council to proceed with the Bill.

Alderman Patteson (Deputy-Chairman) seconded the motion.

Alderman Curtis said that, as the citizens of Manchester had, by a poll, confirmed the action taken by the Water-Works Committee, he was bound to accept the position; but he should try to aid the Council in obtaining better terms than were put down in the clauses of the Bill. The Council knew that loans and debenture stocks were issued with interest half yearly. Assuming that £2,400,000 was spent on the water-works in the first eight years, the interest, supposing it was paid half yearly, would amount to £395,891. The interest, payable yearly, would only amount to £264,265; consequently, the difference between yearly and half yearly payments in eight years would amount to £31,626. He also thought that the £20,000 put down for rent and rates would be less than would really have to be paid, as it did not allow for any contingencies. He thought the Bill contained much too favourable terms for the parties consuming water, and therefore he hoped that, if he could not vote in favour of the Bill as presented, he should still, when it was brought forward, render the Committee what assistance he could. At the same time, feeling, as he did, that the matter was one of very great importance, he should now content himself with giving a negative vote.

Mr. Harwood wished to point out that the Committee had all along been alive to the importance of what Alderman Curtis had called attention to. The question had received the consideration of Dr. Lyon Playfair, and every phase of it had been argued by the ablest counsel in the country. There were other towns interested besides Manchester, and the Committee would take care that the terms were reasonable and equitable, so that others might enjoy the blessings of pure water equally with Manchester. The Committee wanted to introduce no unreasonable demand which would jeopardize the Bill.

Alderman Bennett said he was glad to hear that Alderman Curtis had withdrawn his opposition, and that they were likely to go before Parliament as a united Council. It was fair for him to make the suggestions he did; but, at the same time, he might be in ignorance of the fact that the points to which reference had been made were battled for before the Committee of the House of Commons. All the matters were well considered in Parliament, and the Corporation obtained as much as they could, and to attempt to go for more now would be suicidal on the part of the Committee. He hoped Alderman Curtis would accept the Bill as it was, and do all in his power, as a member of the Council, to promote it in Parliament. Nay, he hoped—and it was not too much to ask of him, considering the expense and trouble to which the Council had been put—that he would go before the Committee of the House of Commons, and say, "I did oppose the Bill under a misapprehension, and now I gracefully retire from my opposition, and will do everything I can for the scheme."

Alderman King said, if there was one point in the Bill which he thought deserving of serious attention, it was that by which other towns were to have a share of the water simply by paying interest on the portion they took. His idea was that, if people received an equal quantity of water, they ought to pay an equal amount of cost. He remarked on the disparity between the estimates Mr. Bateman had prepared, in reference to a water supply for Liverpool from the Lake district, and those for Manchester. With regard to the position which he had taken on this matter, he now felt relieved, to a large extent, from the very serious responsibility he had felt as a representative of the public, because the citizens, by their vote, had endorsed the action of the Council. It did not, however, follow that he must vote that two and two made five, or avoid anything that would enlighten the public on any question in respect to which he felt satisfied they were wrong. He was satisfied, for example, that there was not the amount of rainfall at Thirlmere that had been represented, and should very likely take an opportunity of discussing the point.

The Town Clerk (Sir J. Heron) congratulated the Council on their proceedings that day, in that they had satisfied Alderman Curtis, who had said that, in future, instead of being a witness against the Bill, he would be for the Bill, and would do all he could to assist the Committee in obtaining better terms. The Committee had pledged themselves to deposit the Bill as it passed the House of Commons, and it had been so deposited. To have done otherwise would have jeopardized it.

After some remarks from Alderman Patteson and Alderman Grave, the resolution was carried by 55 votes against 2, and the Council proceeded to other business.

THE NOTTINGHAM CORPORATION AND THE WATER COMPANY'S BILL.

At a Special Meeting of the Nottingham Town Council, on Monday, the 6th inst.—The Mayor (Sir James Oldknow) presiding—the following report of the Town Clerk (Mr. S. G. Johnson), dated Dec. 24, 1878, was presented:—

The Town Clerk reports that the Water-Works Company are promoting, during the present session of Parliament, a Bill for securing the following further powers:—1. To extend the limits within which the Company may supply water, so as to include the parishes of Gedling and Hucknall Torkard, and that part of the parish of Bilborough which lies within four furlongs of the junction (at a place called Cinder Hill) of Bulwell Lane with the road leading from Nottingham to Eastwood. 2. The Company seek to charge upon consumers of water within the said extended limits a sum not exceeding one-fourth part more than the water-rates chargeable in the borough. 3. To make and maintain certain specified works. 4. The Company ask for a period of ten years within which they may exercise the powers conferred upon them by the Act. 5. The Company also seek for powers to take by agreement land for the purposes of their undertaking, not exceeding 20 acres, in addition to the land they are authorized to take by compulsion. 6. The Company propose to apply, for the purposes of the above works, their existing funds. 7. The Company also propose to clothe themselves with the power to supply local authorities with water in bulk, or otherwise, and on such terms and conditions as they may mutually agree upon.

The Company are now empowered to supply the following parishes or places with water, namely:—St. Mary, St. Peter, St. Nicholas, Lenton, Basford, Radford, and Sneinton, the parish of Standard Hill, and the limits of the Castle of Nottingham, Arnold, Beeston, Wilford (the part north of the Trent), Eastwood, Greasley, Nuttall (otherwise Nuthall), Shilo, Papplewick, Linby, Colwick, Wollaton, Bulwell, and Gedling (the small part within the borough). One of the places proposed to be supplied with water by the new Bill of the Water Company is Hucknall Torkard. This place is under the control of a Local Board of Health called "The Hucknall Torkard Local Board." That Board, in pursuance of the Public Health Act, 1875, has commenced the construction of water-works for the purpose of supplying their district with water. They have taken land for that purpose, and have given the proper notices, and are proceeding vigorously with the works. It may be taken as granted that the above-named Board will be able to give their district a sufficient water supply. There seems no reason why Parliament should allow the Nottingham Water Company to compete with the Local Board. It is not probable, therefore, that the Water Company's Act, so far as Hucknall Torkard is concerned, will be allowed to become law if it is opposed by the Local Board. There will then remain only the parish of Gedling (not within the borough) and part of the parish of Bilborough. The population of Gedling, including the townships of Carlton and Stoke Bardolph, at the last census was 3351. The population of Bilborough is extremely scattered, and at the last census was only 225.

In 1854 the capital of the Company was £75,000, with a dividend of 10 per cent. The Company in that year obtained parliamentary powers, under which the then share capital of £75,000 became £150,000 nominal share capital, with a dividend of 5 per cent. They were also authorized to raise the further sum of £100,000, making a share capital of £250,000. This was divided into 5000 shares of the nominal value of £50 each. The new capital of £100,000 could not be raised except under the sanction of the auction clauses. By that Act of Parliament they were also enabled to borrow on mortgage or bond the sum of £15,000, making, in addition to the sum of £25,000 then already raised, the sum of £40,000. In the year 1874 the Company were authorized to issue additional share capital up to £100,000, bearing a dividend of 5 per cent., and to raise on mortgage the further sum of £25,000. The sum of £100,000 was not to be raised under the sanction of the auction clauses. In the year 1878 the Company acquired power to raise new share capital up to £100,000 at the above rate of interest, and they were authorized to borrow on mortgage the additional sum of £25,000. This sum of £100,000 can be raised only

under the sanction of the auction clauses. The total capital of the Company, therefore, is as follows:—Share capital, £450,000; borrowing powers, £90,000; total, £540,000. The present Bill does not propose to increase the capital of the Company; but it is evident that if that capital is exhausted in works, the Company will be obliged to apply to Parliament at an early date for additional capital, which will become a charge on the water consumers of the town.

From the accounts filed with the Clerk of the Peace on the 25th day of March, 1878, it appears that the total amount of capital the Company had raised is £375,010 15s. To this must be added the premiums on shares sold by auction not carrying dividend, amounting to £28,262 12s. 5d. The Company had also raised and applied as capital the proceeds from the sale of superfluous land, amounting to £24,985, making a total sum of £428,258 7s. 5d., capital employed in the concern on the 25th of March last. Of this amount, the sum of £375,010 15s. only bears interest. The Company had raised no part of the sum of £100,000 authorized by the Act of 1878, and they had unused borrowing powers to the extent of nearly £65,000. There was, however, the sum of £1315 5s. 9d. due on the capital account for the year ending March 25, 1878.

From the above accounts it appears that the four quarterly collections of water and other rents at Lady-day, Midsummer-day, Michaelmas-day, and Christmas-day, in the year 1877, amounted to £33,313 7s. 6d. To this must be added land-rents, £244 3s. 6d.; average receipts for goods sold, and other things, £250 (in 1877 these receipts amounted to £595 7s. 1d.); total, £33,807 11s.

The general expenditure for the year 1877 was £12,133 17s. 3d.; dividend and interest paid amounting to £19,804 14s. 2d.; total, £31,938 11s. 5d.; showing a clear profit at the close of the year 1877 of £1868 19s. 7d. This calculation does not include the Trent works, from which, it appears, the Company at present derive no income. The Company also have a balance to their credit in the profit and loss account of £17,065 10s. 8d. The Company have also property in stock amounting to £6546 12s.

The promotion by the Company of the above Bill affords a favourable opportunity to reopen negotiations with them for the transfer of their undertaking to the Corporation, for the public benefit. The Town Clerk recommends that a Committee should be appointed to watch the Company's Bill in its various stages through Parliament, with the view of taking such action in the matter as may be found expedient, and that such Committee should be empowered to treat with the Water Company for the purchase of their undertaking, with the powers which have been heretofore conferred on such Committees.

Alderman THACKERAY moved the adoption of the report. He said he would merely remind the Council that of course, the Water Company having a Bill before Parliament, it was necessary, in the interests of the public at large, and especially in Nottingham, that the Corporation should watch over it as it proceeded. Power also was sought, in case there was an opportunity, of effecting an arrangement with the Company for the purchase of their undertaking. If these clauses were not introduced, the Council would have to go to Parliament to get a purchase confirmed, and as they had to go to Parliament to watch the Bill, they might as well obtain the powers they sought at the same time.

Alderman HOWITT seconded the motion.

Mr. NICHOLLS said he would like to know what arrangement it was proposed to effect with the Company—what per centage was it proposed to give them?

Alderman THACKERAY said it would be very impolitic indeed for the price which they proposed to give to be named. Of course the Council would have to place confidence in the Committee, whom they would appoint to attend to their interests.

The motion was carried without opposition.

Alderman THACKERAY said he proposed the Committee should be composed of the same members as on the former occasion last year.

Mr. WILCOCK asked what the Committee were for—what their duties were? Were they to offer the Company a certain per centage, or do anything else?

Alderman THACKERAY: If we thought the terms of the Company would suit us, we might consider and accept them, subject to the confirmation of the Council.

The motion was seconded, and carried without opposition.

THE MAYOR OF BIRMINGHAM ON GAS-WORKS.

In the course of the recent agitation at Exeter, in reference to the proposed purchase of the gas-works, it was stated in one of the local papers that a heavy loss would accrue to Birmingham through the purchase of its gas-works. The Mayor of Birmingham (Mr. Jesse Collings), a former inhabitant of Exeter, thereupon wrote to one of the townspeople, denying that this was the case. In the course of the letter, he says: "I am of opinion that, provided the gas-works of a town could be purchased at a fair price, no corporation ought to hesitate to make the purchase; and I believe that experience will prove that opinion to be a sound one. The same opinion applies to water-works, tramways, and all monopolies of whatsoever nature.

"Of course, no one can see any limit to the discoveries of science; but, at present, the most sanguine expectations with respect to the electric light do not appear to affect the ultimate value of gas undertakings. Should the electric light, as I hope it will, become available for the lighting of large spaces, halls, squares, &c., it may check, in some degree, the great annual increase in the consumption of gas in our large towns, but it would not, as far as we can see, do more than that.

"The impossibility of storing the electric light, its uncertainty, and other characteristics, will, according to valuable scientific opinion, prevent its becoming a substitute for gas, though it might become a valuable adjunct to it as a lighting power.

"Should it, however, actually supplant gas, the private companies would, of course, suffer; but corporations possessing their own gas-works would be in a different position, as they would, no doubt, retain the monopoly of lighting their towns, and the right of conveyance of wires, &c., whenever needed in their thoroughfares.

"It must also be remembered that gas has hitherto only been regarded as a lighting agent. I have no doubt that its qualities and uses as a heating agent will be rapidly developed in the future. In Birmingham it is already used to a very large extent for manufacturing purposes, such as jewellers furnaces, heating irons, and numerous other uses connected with various trades. There are also many families, large and small, together with hotels, clubs, and other institutions, in which the cooking is wholly done by gas; and I know many private houses, and the number is rapidly increasing, which have as many as six or eight gas fires, a properly-constructed gas fire being found to be economical, clean, and convenient.

"There is also the production of residuals, which is in itself becoming a more and more valuable trade. The Corporation of Birmingham have turned their attention to this matter, and have obtained for one of their most important residuals (ammoniacal liquor) about three times the price which the Companies received for it. So that I have no hesitation in saying that the manufacture of gas is becoming an important one, independently of its use as an illuminating agent.

"It would take too long to go into the terms upon which we purchased the two undertakings which are now the property of the Corporation. The sum paid for the Birmingham Gas Company's undertaking was £450,000, for which amount the whole concern was transferred to the Corporation, including a reserve-fund of about £6000. The undertaking of the Birmingham and Staffordshire Company was bought on a different basis. The capital of that Company was £670,400, half of which capital bore a maximum dividend of 10 per cent., and the remaining half a maximum dividend of 7½ per cent. The Corporation granted to the Shareholders perpetual annuities equal to the amount of these maximum dividends respectively, for the transfer of their interests in the undertaking. They also agreed that the Company should retain for itself the amount of the reserve-fund, as ascertained at the date of the transfer, and also the sum of £11,000 which stood in the Company's books as capital not bearing interest.

"The works of the Staffordshire Company were modern, well planned, and in a satisfactory condition. Some of the works of the Birmingham Company were not in so good a condition, and will shortly be abandoned. It will be seen, therefore, that the Corporation did not buy the works too cheaply, but at a full, though not unreasonable price.

"The sale of gas in Birmingham increases at the rate of 5 per cent. per annum compound, or, in other words, it doubles itself in about 14 years. The large amount of capital required to meet this increasing consumption would have been provided by the old Companies, for which they would have received at least 7 per cent. The Corporation of Birmingham can borrow money at 3¾ and 4 per cent., which fact alone reveals a great source of profit. The Corporation have also made considerable saving in the administration of the concern, and also in the salaries, secretarial, inspection, and other expenses, and a further saving in the matter of directors fees.

"In the time of the Companies, the maximum dividends of 10 and 7½ per cent. were easily gained, and the Companies had no inducement to effect any economy in the manufacture or distribution of gas. Since the undertakings have been transferred to the Corporation, there has, of course, been no limitation to the amount of profit which the Corporation make, and they have therefore administered the undertaking much more economically, in every way, than in the days of the Companies.

"The result is, that in the three years ended December, 1877, £80,000 have been paid, out of the profits of the undertaking, to the borough-fund, in relief of the rates; whilst about £50,000 have been carried to the credit of the reserve and sinking funds. And, it may be specially noticed, as an important incident, that this result has been obtained in spite of the fact that, owing to the depressed state of the local trades, and particularly of the iron trade, the revenue from the sale of coke has been from £20,000 to £30,000 per annum less than at the time of the transfer from the Companies."

THE CITY OF PARIS AND THE ELECTRIC LIGHT.

We learn from our contemporary, *Le Journal des Usines à Gas*, that the proposition made by the Compagnie Générale d'Electricité to light a portion of the Boulevards and some of the principal streets of Paris by the Jablochkoff candle, has been under the consideration of the Lighting Committee of the Municipal Council, who have heard statements from the representatives of the Electric Light Company as well as from the General Director of the Paris Gas Company.

"If we are rightly informed," says our contemporary, "the trials of the illuminating power of the Jablochkoff candles in the Avenue de l'Opéra have given results very much below those indicated by the electricians, and it has been specially noticed that there have been considerable variations in the intensity of the light—variations which were quite apparent to the eye of an experienced person, without necessitating the use of a photometer.

"It would appear that one of the difficulties which the Compagnie Générale d'Electricité have not been able to solve is the diminution in the lighting after midnight; and it would be singular indeed if the Paris Gas Company were called upon, at that hour, to take up a work which the electricians were incapable of carrying out.

"Then comes the question of the localities in which the steam-engines are to be fitted up. Considerable difficulty would be experienced in finding, in the immediate neighbourhood of the area proposed to be lighted, householders simple enough to lower the letting value of their property by converting it into works. We are quite aware that the electricians evade this point by asking the Municipality to provide the necessary sites for the engines; but it seems to us that the question is nevertheless no less difficult of solution.

"Lastly, there is the question of cost. If the Jablochkoff candles really do not give a light equal to more than from 6 to 7 Carcel burners—say 10—that light is not worth more than 15c. (1½d.) per hour, and it is said that it costs the Compagnie Générale d'Electricité 1 fr. (10d.), exclusive of interest and sinking-fund.

"Let us, therefore, await patiently the decision of the Municipal Council, which will be given in the course of the present month, and which, we hope, will be of such a nature as to protect the interests of the ratepayers. It is probable that before the announcement of that decision is made the Paris Gas Company will determine to prove that it is possible for them to furnish by gas an illumination quite as brilliant as that produced by the electric light, at much less cost to the city, and at the same time at a price that shall be remunerative to their Shareholders."

Since the above was written, the Lighting Committee of the Paris Municipality have reported in favour of a twelve months experiment with the electric light. The Avenue de l'Opéra, the Place de la Bastille, and one of the buildings in the Halles Centrales, are to be lighted by electricity, at a charge not exceeding 30 c. per hour for each lamp. The Paris Gas Company are to light the Rue du Quatre Septembre, the Place du Château d'Eau, and another of the market buildings, in an improved manner, at an extra charge of not more than 5 c. per cubic mètre. *The Times* Paris Correspondent says that the Gas Company will place four or eight burners on the present lamps, covered with large shades, thus consuming about seven times as much gas. The Electric Company hope to be able to reduce the motive power from 1·25-horse power per burner to 0·33, which would bring down the cost from 73 c. to 60 c.

APPARATUS FOR PRODUCING CARBURETTED HYDROGEN GAS.

An ingenious apparatus for the production of carburetted hydrogen gas, from either ordinary or filtered water, has recently been invented by Mr. Stephan, in which a steam-boiler, preferably saddle-shaped, is employed to contain the water. In this boiler a retort is placed in such a manner that between it and the boiler there shall be sufficient space for the fire, which serves to heat both. The vapour after being generated in the boiler, passes, by means of a syphon, into one end of the retort, communication between the latter and the boiler being thus established. The retort is furnished with a honeycomb chamber formed of a number of perforated discs or metallic tubes, hermetically enclosed, beyond which is placed a carburator, consisting of a mass of carbon or suitable carbonate, by preference calcareous stone, placed in the retort at a small distance from the metallic chamber. It is enclosed in a cage or basket to allow of it being easily put into or withdrawn from the retort. A second carburator is placed in the retort, beyond the first one, and this may consist of any suitable material containing a large proportion of hydrocarbon, such as bones, chalk saturated with petroleum, carbon, coal dust, wood sawdust, or creosote; but any kind of metallic carbon will serve equally well for these carburators.

The vapour from the boiler passes through the syphon into the retort, and is forced through the metallic chamber, which, by becoming heated,

extracts the oxygen from the vapour, and leaves the hydrogen. It then passes through the first carburator, which is preferably of calcareous stone, and should be placed at some distance from the metallic chamber, in such a way as to generate at this point an accumulation of hydrogen, and thus to create a pressure upon the carburator. When the gas escapes from this carburator, it is carburetted hydrogen burning with a reddish flame, but it should afterwards pass through the second carburator, composed of the hydrocarbons, after which it will burn with a brilliant clear flame. The residues that are susceptible of utilization ascend in the form of vapour from the retort through a pipe into the condenser and refrigerator, while the rest are carried away in the cage.

Other forms of apparatus may be employed, as, for example, the boiler may be placed above the retort, and the fire below. However, the apparatus generally preferred is that consisting of three concentric chambers, the retort being surrounded by the oven, which in its turn is surrounded by the boiler. The gas once generated may, the inventor states, be employed in place of any other heating medium for the production of fresh supplies.

GAS LIGHTING *VERSUS* ELECTRIC LIGHTING: THEIR COMPARATIVE COST AND VALUE.

By Messrs. T. N. Kirkham, M.Inst.C.E., F.C.S., and T. Hersey,
Late of the Imperial Gaslight Company, London.

The gas scare continues, and is likely to do so, while day after day the newspapers insert fresh pieces of news as to the progress of electric lighting, each new thing being, if only true and practicable, sufficient to considerably injure the gas companies.

As, however, there is not, at present, much real data as to the cost and value of the electric light, from experiments in England, open to the public, we, as experienced Gas Engineers, have investigated for ourselves the data furnished by M. Hippolyte Fontaine, as to the results of using the electric light in France, and we have personally examined the Jablochkoff system, as shown at Messrs. Wells and Co.'s, in Shoreditch; that of Mr. Werdermann, in the Euston Road; the Rapieff system, at *The Times* Office; and the Lontin light, at the Gaiety Theatre.

But, before going into the cost and value of the electric light, we, as having a considerable knowledge of the management of the Metropolitan Gas Companies, desire to say that we are utterly at a loss to understand the reason for the cry raised against them by the newspapers, which, almost without exception, appear to have a grievance, and to represent that the public in general have great cause for complaint; and as we know this to be without adequate foundation, we think it right to say so, and point out that it is almost impossible for any producers of an article for sale to be more stringently kept from going wrong—even if they desired to do so—than are the Metropolitan Gas Companies, and especially those of them who are under the more recent legislation. These represent share and loan capital amounting to £9,570,571, out of a total, in the Metropolis, of £11,845,749.

This legislation binds the Companies under it to give an illuminating power of 16 candles; and that they do give this, and more, is proved by the official testing of the Metropolitan Board of Works and the Corporation of London, who would be ready enough to enforce the penalties if there had been default, as has been proved by the enforcement, on two or three occasions, of the severe penalties for slight excesses in the sulphur impurity, which the Companies are compelled to keep as low as the Referees appointed by the Board of Trade can reasonably call upon them to do.

As regards pressure, the Act of Parliament has prescribed a minimum; but it is very seldom that it is even approached, so desirous are the Companies that a full supply of gas should be afforded to all their customers; but with the enormous business of the Companies, there must necessarily arise defects from time to time, and all they can do is to have a sufficient staff of inspectors and workmen to remedy them without unnecessary delay. It should, however, be understood that much the larger number of complaints arise from defects in the fittings or burners belonging to the consumers, for which the Companies are not in any way responsible.

As regards the meters, the Companies supply them at a rental to almost all their customers, although they are not compelled to do so except as to the smaller sizes of meters; but the consumers of gas can, if they please, purchase meters for themselves from any maker, and, so long as they are good enough to obtain the official stamp for correctness of registration, the Companies must allow them to be used. "Correctness," however, means that meters may be stamped as correct if they register 3 per cent. against the Companies, but they are not allowed to pass if they register more than 2 per cent. against the consumer. So even in this the consumer is favoured at the expense of the Companies.

We are quite at a loss to understand what the sins of the Companies are, except that Parliament, after lengthened inquiry, thought fit to grant them a regulated monopoly, which has been found to be beneficial both to the Companies and the public, as, while the former have paid good dividends, the latter have experienced a rapid decrease of price with a great improvement in the quality of the gas; the disturbance of the streets has been reduced to a minimum, and the wasteful outlay of capital avoided.

It should, however, be remembered, that although the Companies pay their prescribed dividends, varying from 4 to 10 per cent., very large portions of the capital have changed hands at high prices, so that recently the owners have been content with less than 5 per cent., seeing that the property appeared to be fairly safe. Unfortunately, they have now been rudely awakened by a loss of nearly one-third of what was lately the market value of their property.

We are of opinion that this fall in value is entirely due to the action of the Press in puffing the electric light, as it is quite clear that if there were really anything in it, those Russian and other gentlemen from the Continent have a much larger field for its use in their own countries than there is here, seeing that gas on the Continent is not only very poor but very dear, while in this country the reverse is the case; indeed, it may with truth be said that gas is one of the very few things that continues to improve in quality and to be reduced in price.

Having said a few words about gas, we proceed to say what we think of the electric light, more especially as regards its cost, as we think it is almost unnecessary to say anything about its convenience, seeing that, as at present used, nothing could be more inconvenient, whether we regard the production of the current, the daily and hourly recurring trouble of replacing the carbons, or the probability of being from time to time entirely without lights, through the breaking down of the steam or gas engine, or some portion of the electric machinery.

It appears to be thought that electricity is to replace gas lighting to a very great extent, and that the capital necessary will not be very large, which appears to us to be an erroneous idea, as we believe that a very large capital will be required if much business is to be done; but we do not believe that capitalists will be found to invest their money in it. It is true that not much land would be required for works or storeage, but capital will be largely necessary for other purposes, and, to begin with, a very considerable sum to obtain parliamentary powers.

Assuming that the electric light companies will be prepared to supply light from stations, as it cannot be supposed that private consumers would be willing to incur the expense for engines and machines, or provide engine-rooms for themselves, then a very large number of stations would be required, as it appears to be certain that the radius of supply must be very limited, and it will be necessary to have the stations, if only the public lamps and large factories and places of that description are to be supplied.

We think that before the electric light is much used for private lighting it should be thoroughly tested for the public lamps, of which there are about 50,000 in the Metropolis, which, at the ordinary distance of 50 yards apart, represent about 1420 miles of road; and as it would be necessary, in most cases, to place a main on each side of the road, to carry the cables, about 2500 miles of mains would be required, which, at a low estimate, would cost, including the relaying of pavement, £880,000, and the service-pipes to the lamps, £25,000.

The inconvenience to the public of taking up and relaying the pavement would necessarily be very great and long continued.

The cost of the cable (if only one were used), 2840 miles, at 3s. 4d. per yard, would be £416,660; to this must be added, for wires and fittings to the lamps, say, 4s. each, £10,000.

If we assume that Mr. Werdermann's system of dividing the electric light is, as yet, that most likely to be adopted—as he appears to have succeeded in bringing down the light to a manageable size—and that the ten lights he produces do really give the light of 40 standard candles each, then each of these would be equal to nearly three public lamp-burners, and ten of them would supersede 30 gas-lamps, if Mr. Werdermann can, without loss of light, convey the current the 1500 yards the 30 lamps cover. Supposing him to be able to do so, and that the limit be 1500 yards, about 1700 stations would be necessary, and they may be estimated to cost, at a very moderate estimate, not less than £100 each for land and buildings, or £170,000.

Then, according to M. Fontaine (p. 155) and Mr. Werdermann, to produce the ten small lights, a 2-horse engine is necessary. M. Fontaine (p. 156) states, however, that 75 per cent. more than the ordinary working power is required to put the machines in action. Assuming that they are right, and that gas-engines as recommended be used, the cost of the 1700, as per Crossley's list, would be £234,600. It is difficult to say exactly what the Gramme machines cost (see Fontaine, p. 162), but we have estimated each station to cost £100 for machines and gearing, say £170,000. These items, without any allowances for contingencies, amount to £1,906,260, namely:—

Mains	£880,000
Service-pipes	8,333
Cable	416,660
Wires and fittings	10,000
Stations	170,000
Engines	234,600
Machines	170,000
Estimated capital for 16,666 lamps	£1,889,593

Estimated annual charge for 16,666 lamps:—

Interest on above capital, at 10 per cent.	£188,959
Maintenance and contingencies on engines and machinery, at 8 per cent.	26,500
Maintenance of engine stations, mains, service-pipes, &c., at 2 per cent.	21,500
Cost of gas for fuel, estimated at 21 feet per horse power per hour, for 1700 2-horse engines, at 400 hours per annum	47,600
1700 engine drivers, at 5s. per day	155,125
200 men, at 25s. per week, for replacing carbons daily, cleaning lanterns, &c.	13,000
Painting and maintenance of lamp-columns and lanterns, 16,666 lamps, at 3s. each per annum, as paid by gas companies	2,500
Carbons for 16,666 electric lamps in lieu of 50,000 gas lamps, at 1d. per hour, 400 hours per annum	277,766
Total	£772,950

To this annual charge of £772,950 should be added rates and taxes, oil for engines, &c., &c.; but as the amount is already nearly four times that paid for lighting the public lamps by gas, viz.:—

50,000 lamps at 20,000 feet per annum, at 3s. 4d. per 1000 feet	£158,333
Lighting, cleaning, and maintaining, 18s. each	45,000
	£203,333

it may safely be left where it is.

If our estimate of the cost of electric lighting be even approximately correct, we think we have shown that there is no probability of it being used largely for the public lights, as, whatever its merits may be, there is not the slightest chance of the Local Authorities, who control the public lighting, putting it in use. Recent experience shows, in the adoption by some parishes of the average meter system, that if, by shortening the hours during which the lamps are burning, and by reducing the size of the burners, they can effect a saving of a few hundred pounds a year, they think they have achieved a great success; and having done this by the outlay of a considerable sum for meters, &c., they are not at all likely to increase the cost of lighting the streets, which they doubtless consider are now sufficiently lighted, even if they could get 100 per cent. more light for 20 per cent. more money, much less if they are asked to pay 160 per cent. more, as was the case in Paris; even with the high price of gas there—namely, 6s. 9d. per 1000 feet, as compared with from 3s. to 3s. 6d. in London.

Having, as we think, shown good reasons why the electric lights are not likely to supersede gas for the public lights, we proceed to suggest some objections to it for private lighting, although we think it scarcely necessary to do so, as the promoters of the electric light companies almost admit they do not anticipate any demand for it for ordinary shop or house lighting. M. Hippolyte Fontaine says (p. 144 of Dr. Higgs's translation), "That without being absolutely impossible, it is difficult to introduce the electric light where ceilings are of less height than 13 feet;" and, again (p. 104), "That manufacturers who pay only 7s. per 1000 feet for their gas, and find their establishments sufficiently lighted with 20 burners, should not seek a more economical light, unless they work all night without interruption." These two extracts sufficiently show that, even in the views of the advocates of electric lighting, a very large proportion of the consumers of gas are unlikely to be benefited by electric lighting, seeing how comparatively few are the rooms and shops 13 feet high, and seeing that manufacturers and others in this country can obtain at least 40 burners for the cost of 20 in France. Thus the widest field is still left for gas companies, even if electricity relieves them of a few open spaces, railway stations, and manufactories.

M. Gramme advises (p. 161) "That the machines be used only where there are large spaces to be lighted, and where there is sufficient power to prevent the addition of one or two machines interfering with the regular

process of the work. 90 per cent. of the places in France, where this light is used, are on that data." This shows clearly that, even in France, it will not pay to provide separate engine power for electric lighting, and, therefore, it leaves the great bulk of the lighting to be done by gas. Assuming, however, that it will not be necessary to limit electric lighting to railway stations, large manufactories, and such like buildings, and that it may altogether supersede gas, we again come to the question of cost; and it would appear that, even if the engine-houses and mains supposed to be provided for lighting the public lamps should be sufficient also to contain engines and cables for the private lights, the further capital needed to supply about 240,000 consumers now using about 2,900,000 burners, would be about £17,839,000.

Then, assuming that the engine-houses for public lamps would do also for the private lights, that the engine drivers would also be able to do all the work for public and private lighting, and that the cables for 2,900,000 burners would not cost more than the estimated £416,000 for the 16,666 electric public lamps, we arrive at the following estimate, viz.:—

240,000 service-pipes, at 10s.	£120,000
Cable	416,660
Wires and fittings, at 4s.	48,000
Assuming that 40 ordinary private lights would be equal to 10 Werdermann small lights, 72,500 2-horse gas-engines, at £138, would be required	10,005,000
72,500 Gramme machines and gearing, &c.	7,250,000
Total	£17,839,660

Annual charge upon the foregoing:—	
Interest at 10 per cent.	£1,783,966
Maintenance and contingencies on engines and electric machinery, at 8 per cent.	1,417,572
Consumption of gas, for fuel, say four hours per day, 21 feet per horse power, 4,752,300,000 feet, at 3s. 4d. per 1000 feet	792,050
Assuming that each of the Werdermann small lights would be equal to four ordinary house burners, 725,000 electric lights would be required to replace the 2,900,000 gas lights, and the carbons burning four hours per day, at one penny per hour per light, as by Mr. Werdermann, would cost £12,083 per day, or per annum	4,414,295
Total	£8,407,883

These few items make up a total of £8,407,883, while the total rental for gas lights, in 1877, for the whole of London was only £2,663,917.

It may be said that the cost for power would be very much reduced by using steam-engines of large size, but this would be counterbalanced by the much larger engine and boiler houses that would be required, and by the necessity there would be of always keeping steam ready for use, and therefore at large expense, which would be avoided by the use of gas-engines, seeing that they are always ready for use at a moment's notice.

It may also be said that the cost for power might be reduced by the use of larger gas-engines, which is true, as an 8-horse engine would not cost twice as much as a 2-horse engine, but in many cases this would involve the use of much more than the actual power required; so that, upon the whole, the advantage would be in favour of a large number of small engines, rather than a smaller number of large ones, especially as with small engines it would be easy to keep a spare one, to use in the event of accident.

If, however, the larger-sized gas-engines be preferred, the outlay of capital for the private lights would be reduced to £12,474,600, which would still be very much in excess of the capital invested for gas.

It might be possible to obtain carbons, nearly 800,000 per day; but the manipulation of them would not be an easy matter, and it would probably be necessary for the electric light companies—should they ever be in existence—to maintain and charge for a staff of men to go round daily to adjust the carbons, wires, &c., which, of course, would add materially to the cost of the system, and would certainly be much less convenient than the existing state of things.

We know, and, all consumers know, the exact cost of gas, but it is probable that we have, from imperfect acquaintance with the electric light, omitted many items of the cost of it. We think, however, we have clearly shown that the probable cost of electric lighting is enormous, and that there is not the slightest chance of profit from it as a light for general purposes, if people could be induced to use it, which we very much doubt, even if it could be supplied from large stations like gas, and with as little trouble to the consumer, as it would involve, in all cases, alteration or substitution of fittings at considerable cost, and it is difficult to believe that, after the novelty had worn off, any person would say it was a pleasant light, as compared with gas or other mode of lighting, for domestic purposes now in use.

As regards the amount of illuminating power from the electric lights, we observe that in almost all cases the light of 1000 candles and upwards is claimed, whereas Mr. Shoolbred, at the Society of Arts, showed from the careful experiments made by the Engineers of the Lighting Department of the City of Paris, that the maximum illuminating power of the naked Jablochkoff light was equal to only 300 candles, which was reduced to 180 by the opaque globe, and that it varied between 180 and 90 candles, proving not only the deficiency in illuminating power, but what every one must have observed, the great want of steadiness in the light, which certainly would not be tolerated with gas lights. This unsteadiness is not confined to the Jablochkoff candle, as it is very noticeable in the Rapieff lights at *The Times* Office, where, besides the inherent irregularity, we noticed that, during about 20 minutes, when we had the opportunity of witnessing the lights in the machine-room, three of the six lights that were in use were, from some cause, out of order, and had to be readjusted, and one of the lamps to be exchanged, and this, although they were under the care of M. Rapieff himself and his practised assistants. What, then, would this light be in ordinary use?

We did not observe so much irregularity in the Werdermann lights in the Euston Road, as, during our inspection, only one of the large lights required attention; but the illuminating power did not appear to us to be of anything like the amount stated, as, when all the ten small lights were in use, which were said to be equal to 40 candles each, the lighting or extinguishing of two gas-burners made a very material difference in the lighting of the place.

We have looked into this matter carefully, and are fully convinced that, until very great improvements be made, the electric light will have no chance in competition with gas for ordinary purposes, even if the cost were no greater than that of gas; but, seeing that the electric light is enormously expensive, that all existing arrangements in our houses must be upset before it can be used, that the streets must again be pulled to pieces for the pipes to be laid, and again from time to time for repairs and alterations, we have no hesitation in saying that the proprietors of gas shares need not, in our opinion, be alarmed, either for their dividends or for their capital, at present prices. We believe that there was not sufficient reason for the fall; and the more we examine the question, the more we are assured that gas is not to be superseded by any light at present before the world.

ELECTRIC LIGHTING IN RELATION TO THE INTERESTS OF GAS COMPANIES.

By Mr. Alfred H. Wood, A. Inst. C.E., Engineer and General Manager of the Hastings and St. Leonards Gas Company.

[A Report read to the Directors of the Company on Dec. 5, 1878.]

Gentlemen,—During the last two or three months I have had many opportunities of investigating the mode of production, relative value, cost, and many other points connected with the electric light. I have also carefully studied every publication of any value on the subject, and seen several exhibitions of it, both on a large and small scale, and I now propose, with your permission, to give you a condensed view of the subject, that you may judge for yourselves how far the interest of gas companies is at stake.

There are three points that prominently present themselves to every one who has studied the subject. The first is: The nature of the electric light; the second, The relation it bears to other modes of artificial illumination—especially coal gas; and the third, What action should gas companies take in relation to it? And for the sake of method, and to get as much as possible in a small space, I shall make a few remarks on these points, in the same order as I have named them.

Sir Humphry Davy first produced the electric light at the commencement of the present century; but he did not use the same means as are now generally practised for large displays, the electric current, in his case, being produced by a powerful galvanic battery, and may be said to have assumed only the shape of an enormous experiment, not resolving itself into any practical shape. But Faraday, in 1831, made discoveries which led up to the present form of magneto-electric machines, the first one, I believe, being perfected by a citizen of London, named Holmes, in the year 1849, and an exhibition of the then new light was made at the first International Exhibition, in Hyde Park, in 1851, which exhibition of the light I perfectly well recollect witnessing myself.

To be short, from that time to this, these machines have been gradually improved. Many, very many new ones have been invented, of more or less value, among them that of the Alliance Company, Siemens, and Gramme. All these, and many more, have their respective virtues, but of all that I have seen, read, and witnessed, I should say that that of Gramme is the most scientific and practical; in fact, it is a machine capable of doing a large amount of work in a very quiet and marked manner, and I should think with as little cost as any that have been before the public.

For time's sake, however, I will skip from the machine to the light itself, for this is what the public seem most taken with. The regulator, as it is called, is a most delicate piece of apparatus, and much is dependent on this for the successful display of the light. There are several of these regulators before the public, one of which I have had drawn on a rather large scale, that you may thoroughly understand it.

The electric arc, you will observe, is formed between two points of carbon, and the distance between the two electrodes, as they are called, has to be kept exact, in order that the same intensity of light may be obtained. This is the especial use of the regulator, without which, or some other self-adjusting apparatus, the electric light cannot be maintained. Each light requires one of the regulators. The net cost of the one in the drawing is about £20.

And now, what is the electric light as it stands before the public? Is it a flame, or is it not? Is it a light from the incandescent carbon points, or, as others have described it, as being a luminous condition of carbon vapour? I think none of these theories fully describe it, but that it is a portion of the electric current itself, requiring a deeper knowledge of electricity than I am possessed of in order to make it understood.

Still, we have some indisputable facts before us. Here I have a drawing of the electric arc itself, with the exact position of the two carbon points while the light is being produced; and I can guarantee that this is not a fictitious drawing, for I have myself witnessed the two electrodes largely magnified, and thrown upon a screen, while the light was being produced. The upper carbon is the positive one, which has always a much higher temperature than the lower (or negative), and, consequently, wastes much faster;, in fact, in some cases these carbons wear entirely away every hour or hour and a half, and require renewing, involving much attention and care on the part of the manipulator.

Having given you as short an account as possible of the nature of the electric light, I now proceed to inquire into the question of how far it interferes with other modes of artificial illumination, or especially, to put it in very plain terms, to what extent does it compromise the interest of gas companies.

I shall first make a few remarks on its efficiency. That the electric light, in a certain sense and to a certain extent, is an accomplished fact, no sane person who has studied the subject will attempt to deny. Several large factories in Paris, Rouen, and other parts of France, have been lighted by it with success. Several lighthouses in France, England, Russia, Austria, Sweden, and Egypt have been, and are lighted by it, with the same satisfactory results; but in all these cases cost has been a secondary consideration, the intense light, and that alone, being the one object that has been attended to.

Without assuming any scientific description of the cause, there is, notwithstanding all that has been said, a great want of diffusiveness in the electric light. I was lately one of a body of Gas Engineers who were invited to see what the Chartered Gas Company (the largest gas company in the world) had done in the matter. They lighted a very large room with the electric light, the illuminating power of which was proved to be from 1500 to 2000 candles. Much, however (probably 50 per cent.), of this had to be subdued by translucent opal shades, as it was too intense for the human eye, leaving about half its value only to illuminate the room. But when the electric current was stopped, and the room lighted by the ordinary gas-jets, there could be no two opinions, in my opinion, of the superiority of the latter. The cost, however, of the display was not stated, and I cannot, therefore, give you a relative money value between it and coal gas. Some idea, however, of the relative cost may be gained by estimating the cost only of the carbon points requisite for a 40-candle electric light. So far as I can learn, the carbons cost from ⅓d. to 1d. per hour. Now, for calculating purposes, let us say it costs 1d., and, in the long run, I do not think this will be very wide of the mark. Now, 10 to 12 feet of gas per hour will yield a light equal to 40 candles, which gas will cost only ¼d. If, then, ¼d. worth of gas will yield just as much light as can be produced by 1d. worth of carbon points, what must be the cost of the electric light for 40-candle power, when all the other expenses are added; for, be it remembered, the ⅗d. or 1d., as we have received it in the rough, includes nothing but the carbon points, and to it must be added all the labour and expense of working the motive power, electric machine, interest on capital, &c., &c., making the expense not only doubled, but tripled or quadrupled, before it is done.

I, perhaps, am not at liberty here to mention names, but I have had

figures from a gentleman who lately spent a considerable time in Paris, in order to arrive at something like the facts relative to the cost of electric lighting compared with gas. Nothing could be fairer than the mode he adopted. He took one of the leading thoroughfares (I forget the name), and arrived at the cost of lighting by electric light, as it was then done, for one year, and he then estimated the cost of the same amount of light from coal gas for the same period, and he made the cost, *light for light*, to be £13,000 per annum for the electric light, and £2800 per annum for coal gas. I feel sure the estimate was most conscientiously made, and I believe it has never been disputed, even by the most sanguine supporter of the electric light. Nor is the gentleman I allude to alone in his calculations. Professor E. V. Gardner, who, yesterday week, lectured at the Pavilion, Eastbourne, came to conclusions very similar; in fact, although his estimates were in a rough form, they contain the same idea of the new (?) light being infinitely dearer than coal gas. He said, "The electric light might supersede the gas light, but at what cost? Where the latter cost 3s. 9d., the former would necessitate an outlay of £3, and for an increase in the quantity of light an increase in the expenditure would be required. It had been used in London and elsewhere for years. It had been employed in Paris for about nine years, but it had not advanced much during that time. From his experience it was not so cheap as gas. The Jablochkoff candle, which was the form used, from its very construction was liable to "run down;" it did not give a steady light, and it required a thoroughly experienced man to attend to it. For three Jablochkoff candles, be they good, bad, or indifferent, they must, at least, have a 6-horse power engine. That with the electric light they had a powerful light, no one could doubt; but it was of a peculiar and unstable character. He believed that gas light would remain for many years, because there was this difficulty in shunting the electric light, or placing it round a room, that they could not do it under a 14 or 15 horse power engine. In Paris, where it was used, they had a gas standard between each electric standard. They lit the electric light about eight o'clock in the evening, and kept it on till between eleven and twelve o'clock, when they lit up the gas. If the electric light were cheaper, why did they not keep it in continuation? The truth was that, in the present condition of the electric light, they had made very little advance, and, so far as the scare among gas companies was concerned, if he had sufficient money, he would buy up all the shares from those who wished to dispose of them." But, putting aside all mere estimates, it appears, by the actual cost recently worked out by the Authorities at Paris, that their experience during this last summer's blaze has been anything but an economical one. In fact, if I understand it correctly, the Jablochkoff candle, as used in Paris during the last summer, has cost two or three times what gas would have done. Mr. James N. Shoolbred, B.A., who read a paper at the Society of Arts, last evening, supplied us with figures which leave no doubt upon the question. Proceeding to a description of electric street lighting in Paris, Mr. Shoolbred stated that "while the patentees of the Jablochkoff system had kept up a very considerable amount of mystery as to the cost of their light, the result, as worked out by the Authorities of the City of Paris, showed that the cost of the Jablochkoff light was 2·6 times that of gas. Accordingly, the Authorities terminated the contract on the last day of November."

These results give us little fear as to cost of production in the question of electric light *versus* gas.

Now, as to the question of divisibility. We all know what a scare was created by the news telegraphed from America that Edison had discovered the means of dividing the electric current to any number of points. But Edison was too late in the field, for Werdermann had secured patents for the purpose in London long before Edison's scare took place. I had the pleasure of being one of a party of Gas Engineers who were specially invited by Mr. Werdermann, on the 14th of November last, to witness an exhibition of his own for dividing the electric current. He had first two electric lights, estimated at 300 candles each, but which he owned afterwards, when interrogated by myself and Mr. Livesey, of the South Metropolitan Gas Company, were only equal to 150 or 200 candles each. These two lights, originally estimated at 600 candles together, were afterwards divided into ten smaller ones, each estimated at 40 candles, but which I put down at not more than 20 to 25 candles each. These Mr. Werdermann could, and did turn off and light up at his will, without in the least interfering with the others, but at a great loss of luminosity—no doubt on account of the greater resistance in the wire the current had to travel—I should estimate a loss of 30 to 40 per cent. in the distributing apparatus. I may here add my grateful acknowledgments to Mr. Werdermann, not only for his exhibition, but for his courteous manner in describing the whole apparatus, and kindly answering any and every question put to him by myself or any of my brother Engineers.

It, however, appears to me that too much stress has been laid on the question of divisibility, as though everything followed as a matter of course, because an electrician had managed to divide the light in laboratory practice. To my mind, neither Edison's pretended discovery, nor Werdermann's, partakes so much of originality as most people think; the whole having been thought out and experimented upon many years ago. To prove the point, and also to close this part of my subject, I will just quote from a communication to the Academy of Sciences in Paris, the notice being dated (and I beg you will notice the date) Feb. 27, 1858 (now nearly 21 years ago). The communication is from M. Jobert, and is as follows:—

[Then follows a translation of the communication, the substance of which appeared in Mr. Deacon's report, given in the JOURNAL of Dec. 31, p. 956.]

But, whether the matter of divisibility be new or old, there can be no doubt that, to a certain extent, electric lighting has passed the stage of experimental research. It can be used, and is used, for large areas, public buildings, fortifications, and other conditions, where a great concentration of light is required for a special purpose. But through all these stages, for the last 20 years, it has never been reduced so as to be used for domestic purposes, nor does it seem at present likely to be so. M. Fontaine himself, in the last and best work published in favour of electric lighting by the Jablochkoff candle and other means, says: "There is no doubt that each of the systems proposed is capable of rendering important service in special cases, but the error that inventors have fallen into has been the claiming of too great a scope for their apparatus, as leading immediately to the supplanting of gas. The electric light has already a vast field of application open to it, and Chapters VII. and VIII. treat of the great advantages attaching to its employment in a number of cases, but that it will some day entirely take the place of gas is extremely improbable. It has, in fact, only been since the introduction of electric lighting that our admiration for the facility with which gas can be divided and distributed has been fairly aroused."

But, be this as it may, it must be right for gas companies to be upon their watch-tower. And this brings me to my third and last proposition—What action should gas companies take in relation to the present condition of electric lighting?

1. Take the first opportunity of securing power to supply the electric light, should such supply be requisite. I do not find any gas company asking for these powers in the coming session of Parliament, except when they go for additional capital and other powers. In all hese cases the supply of the electric light is inserted, but should any general Act be suggested to give the power, I think it would be our duty to support it.

2. Use every means to relieve the minds of shareholders from the alarm that many of them have unnecessarily indulged in. It appears to me it is only fair to give them information that would be a relief to them, and I have secured enough copies of Mr. Livesey's letter to distribute freely among the Shareholders, should you think it wise to do so. Any other information you think proper might be sent with it.

3. I think gas companies should cultivate all their undeveloped resources. A gas company ought not to be contented while there is a house in their district in which gas is not used. Every means should be used to introduce it, and if it be but a cottage, a dozen of these may be as good as one large house, and as useful to the revenues of the company. Then I say, seek to introduce gas where it is not at present.

4. Do all you can to encourage day consumption. A large rental might be made from day consumption, without increasing the capital, as much of the plant of a gas company is out of use in the daytime. This may be done by pushing the use of gas cooking-stoves in summer, and gas heating-stoves in the winter. I have for some time past aimed at this by letting out these stoves at a quarterly rental, but I think even more may be done in this direction than has been done up to the present.

5. Look well to your customers burners. There is no subject more misunderstood than that of burners. I know of burners that will bring 14-candle gas down to the appearance of 4 or 5 candles, while others will give it its full value of luminosity; and many hundreds of discontented consumers have, to my personal knowledge, been satisfied, and pleased too, with their gas lighting by doing nothing whatever but replacing their old, worn-out, and improper burners with new and suitable ones fitted to their requirements. Look well, then, to your customers burners; it would pay a gas company a very heavy per centage to give good burners away by wholesale.

6. Keep up some kind of supervision over your customers fittings. Bad internal fittings are a fruitful source of discontent among gas consumers, and, although the fault does not lie with the company, the benefit of remedying the fault will be theirs. Nothing annoys a consumer like an insufficient supply, and the fault generally lies indoors, although it is usually palmed upon the gas company. Persuasions and arguments are useless; the customer wants more light, and sticks to it it is the fault of the gas company. The only remedy is to alter this condition of things, and let him see the cause for himself. It is astonishing what a speedy change takes place in the countenance, disposition, and treatment of a discontented consumer as soon as he finds his supply of gas to be ample to his needs. I had, once, the finest goose that ever graced the table of a gas manager sent me, simply because I put in a larger pipe with satisfactory results, entirely at the cost of the consumer. Such extreme appreciation, I own, is rare; but it is, nevertheless, very gratifying when it occurs. I have by me here two pints of rust, taken, within the last few days, from the fittings of one of our largest hotels. Before I took it out the proprietor was grumbling heavily about his gas supply, and before I had finished he stopped my men, and told them he now got more gas than he could possibly want, and therefore they need not go any farther.

7. Always keep up a good supply of pure gas. One day's failure in the supply or quality will keep some people cackling for a month. It is astonishing how greedy some folks are to find a bone of contention against a gas company, not here only, but all over the country. Let us, then, be careful, as to quantity, purity, and luminosity, never to give our greatest critics a just cause to complain of the article we send them out. I might here have said much more, especially as to using naphthaline for increasing the luminosity of the gas, and other minor matters, but I feel I have ventilated the subject sufficiently; and I am of opinion—and seriously so, based upon all I have seen, heard, and read—that if gas companies are careful to cultivate every undeveloped resource, offer every facility for the consumption of gas, both by night and by day, look well to their customers fittings and burners, send out an article that is in every respect unimpeachable, they will have nothing to fear from any innovations by electric lighting, and instead of reducing, will largely increase their consumptions, revenues, and dividends.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is generally a better tone throughout the coal trade of this district. All good classes of round coal, suitable for house-fire purposes, are in tolerably brisk demand, and for gas-making coals, although there are no fresh inquiries of any importance in the market, there has been a good deal of pressure for deliveries on account of contracts. Colliery proprietors, however, have experienced very great difficulty in getting coal away from the pits, owing to the unfavourable weather, and as this has kept the market rather bare, prices have had an upward tendency, and in many cases advances of about 6d. per ton are now being obtained on all good qualities of round coal. There is, however, no actual scarcity of coal in the district, and there is little doubt that as soon as supplies can come fully into the market, prices, where advances have been made, will drop down to the old level. The inferior classes of round coal are still a drug, in consequence of the depression in the iron trade, and other branches of industry, and burgy and slack also continue difficult to move, the inferior sorts being offered at very low figures. The average quoted prices at the pit mouth are about as under:—Best Wigan Arley, 9s. 6d. to 10s.; good second qualities, 8s. to 8s. 6d.; common, 7s. to 7s. 6d.; Pemberton 4-feet, 7s. to 8s.; common house coal, 6s. to 6s. 6d.; steam and forge coal, 5s. 3d. to 5s. 6d.; burgy, 4s. to 4s. 6d.; and ordinary slack, 2s. 6d. to 3s. 6d. per ton.

There has been rather more demand for shipment, and sellers have been able to obtain a slight advance upon the low prices which have been ruling of late.

In the iron trade there has been very little business doing during the past week, and local makers of pig iron who still adhere to their late rates, are selling little or nothing, as they are so completely undersold by outside brands; whilst merchants, notwithstanding that makers decline to quote farther forward than the next six months, are offering for delivery over the whole of this year at present prices. In finished iron there is no material change, the lower prices reported from South Staffordshire not affecting this district, where manufacturers have already come almost as low as they possibly can.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The state of the coal trade was unaltered last week. A south-east gale kept laden steamers a couple of days behind, and the stormy weather which prevails in the North Sea is likely to considerably derange the time of ordinary boats reaching London and the South—probably into the middle of this week. The shipments of gas coals run pretty uniformly, however. At the present time there is an abundant supply of steam tonnage in the coal ports. Rates are a little more than 4s. 3d. for steamers to load coals for London; 5s. 7½d. per ton has been paid to sailing ships to carry coals to the wharves in the Thames. Contracts continue to be made amongst

the Durham collieries for the supply of gas coals over the year, at the reduction we mentioned last week of something like 6d. per ton upon the contracts of January last year. Reductions of wages are taking place at the pits situated up and down the county of Durham, but not at the large gas collieries. Full time continues to be the rule there. There will be no change over the spring months, as there are sufficient contracts on hand to keep the best of them in full employment. A decent quality of second-class gas coals is sold at 5s. 6d. per ton, medium reaches 6s., very best from 6s. 9d. to 7s.; the last quotation generally with a larger discount.

The coasting freight market, in which the smaller gas companies are concerned, is fully supplied with small ships. Rates are very low for the season of the year. Several Danish and German small vessels are trading with coals from the Tyne to the Channel ports. This, in addition to the ample supply of English tonnage, has a depressing effect upon the freight market. Ships have been engaged here to load gas coals for Ireland. There is a talk at Newcastle of an intention on the part of the Government of the United States to propose the abolition of the duty of 3s. 6d. per ton levied on British gas coals imported into the States. The American colliery owners are not content, it would seem, with having a monopoly of the trade through the restrictive duty, but have established what is called a "vend," which restrains the collieries from producing more than a given quantity of coals over the year, and, of course, making customers pay more money for what they want. Some idea may be formed of the effect of restriction upon the gas coal trade, when it is stated that only 2s. 2d. per ton is offered steamers to carry gas coals across the Atlantic to Boston.

The general manufacturing trades of the North of England show no improvement. The chemical market was comparatively dull last week. Prices were lower. There is no demand for any kind of metal. The market seems full of lead, copper, &c. The fire-brick trade is dull. This business has been kept back over the past three weeks a good deal, through the upper reaches of the Tyne having been frozen. There was a thaw a fortnight ago; but there is every appearance of more ice and obstructions of that sort, as the weather in the North is very inclement.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

At a meeting of the Falkirk Town Council on Thursday, Mr. Coutts drew attention to the matter of the late reduction in the price of gas in that town by the two Gas Companies, and expressed himself as being dissatisfied with the smallness of the reduction. He said that when the new Company acquired the works, they promised to bring about certain reductions. A reduction of 10d. per 1000 cubic feet had been made, but he thought the consumers were still paying at a rate considerably higher than other towns were paying, although the new Company had, he said, agreed to bring Falkirk on an equality with other towns. The Provost explained that the delay in the full reduction of price was due, he believed, to the fact that the Company were not yet properly formed. He had received a letter from Mr. M'Gilchrist, who had charge of the gas manufacture, stating that when the new Company were actually formed, the people of Falkirk would be charged at a rate similar to that paid in other towns.

An extraordinary meeting of the Kirkintilloch Gas Company was held last Monday, to consider the propriety of winding up the Company, and, if deemed expedient, to appoint a liquidator. It was eventually agreed to wind up the Company voluntarily, and Mr. James Stables, of the National Bank of Scotland (local branch) was appointed liquidator.

On Monday, the 6th inst., the Inverness Police Commissioners held an adjourned meeting for the purpose of receiving the estimates on which are based the amounts proposed to be inserted in the application for a Provisional Order for extension of the borrowing powers in connection with the gas and water schemes. The estimates having been submitted—for gas two years, and water one year—the opposition previously announced was raised by Mr. Macdonald, who desiderated the probable expenditure for the next 15 years. The Provost remarked that they had sufficient data before them to warrant them in proceeding with their application for a Provisional Order. It was proposed to apply for powers to borrow £20,000 for water purposes, and £15,000 for gas purposes, to meet probable expenditure during the next 15 years. He mentioned some of the details of the probable expenditure, both for water and gas, which he considered to be perfectly reasonable. A long discussion took place on the subject, and in the end the Provost's motion was carried by a majority of 12 votes to 4.

The Gas Committee of the Hamilton Town Council, at their meeting last Thursday, submitted a minute, stating that, in consequence of numerous reports having reached them regarding gas escapes, more especially in the lower parts of the town, they had instructed the Manager to examine and report as to the cost of relaying those parts where the pipes were old and decayed. At the same meeting, it was reported that the actual cost of making gas at the Corporation Gas-Works was 1s. 3½d. per 1000 feet, the illuminating power being 28·8 standard candles.

At a special meeting of the Brechin Gas Company, held last Wednesday, Mr. William Whitson, solicitor, was elected Secretary, in place of Provost Will, deceased.

The Directors of the Irvine Gas Company resolved, a few days ago, to reduce the price of gas 5d. per 1000 cubic feet. The price will now be 5s. per 1000 feet.

The Johnstone Police Commissioners having asked Dr. Anderson Kirkwood to reconsider his recent decision in the arbitration proceedings for the purchase of the local gas works, the case was debated in Glasgow on Wednesday last, and on Saturday Dr. Kirkwood issued the following interlocutor:—"Having resumed consideration of this submission with the representations and answers, Nos. 33, 34, 35, and 36 of the proceedings, the oversman adheres to his interlocutor of Dec. 9 last, with this explanation, that the claimants are entitled to the profits for the year to April 30, 1878, although it appears that these were not actually divided among the claimant shareholders until July of last year. Further, the oversman, of consent, now appoints Mr. David Young, writer, Paisley, as Auditor, to tax the accounts found due by the interlocutor of Dec. 9 last, and has accordingly filled in his name as Auditor in that interlocutor."

The following statistics show the great progress that has been made in the gas supply in Dundee during the last ten years:—

Year.	Quantity of Gas made in Cubic Feet.
1869-70	200,838,200
1870-71	214,295,100
1871-72	234,224,000
1872-73	252,294,300
1873-74	265,994,800
1874-75	268,945,600
1875-76	285,313,300
1876-77	292,604,700
1877-78	316,054,900
1878-79 (Estimated)	320,000,000

The annual accounts just published in connection with the Greenock Municipal Trusts show that the revenue of the gas supply undertaking for 1878 was £39,130 4s. 8d., as compared with an expenditure of £34,371 3s. 6d., while the gross debt amounts to £138,728 3s. For Dundee the amounts stand thus:—Revenue, £60,615 4s. 2d.; expenditure, including interest and sinking-fund on debt, £59,447 19s.; debt, £116,647 10s. There are also annuities, amounting to £8500 0s. 2d., which are not capitalized.

The Glasgow Corporation 9 per Cent. Gas Annuities, which stood at £206 on Saturday week, were offered at £203, but buyers held out for £201; and on the following day business was done at £202. Edinburgh and Leith Gas Company's stock changed hands on Wednesday at £29—an advance of 15s. from Tuesday's quotations.

Last week's Glasgow pig iron market was firm at the beginning, but prices gradually receded, and on Friday business was done down to 42s. 4½d. cash.

The coal market was very quiet during the week, the holidays having interrupted business. House descriptions are still in fair request. The demand for coal suitable for manufacturing purposes remains exceedingly quiet.

THIRSK WATER-WORKS COMPANY, LIMITED.—This Company was registered on the 20th ult., with a capital of £16,000, in £5 shares, to carry on the general business of a water company, in the neighbourhood of Thirsk, in the North Riding of York.

REDUCTION IN THE PRICE OF GAS AT BATLEY.—At a meeting of the Batley Town Council last Thursday, it was resolved to reduce the price of gas to consumers within the borough to 3s. 9d. per 1000 feet, and to 4s. to consumers outside the borough, with 6d. per 1000 feet discount in each case for prompt payment.

THE SEWAGE OF HEREFORD.—It is reported that an action having been commenced by one of the Conservators of the Wye Fishery Board, against the Mayor and Corporation of Hereford, to compel them to dispose of the city sewage otherwise than by polluting the River Wye, they have resolved to pay the costs of the action, and to submit to an order being made upon them to wholly divert the sewage from the river in three years, by means of a sewage farm two miles east of the city.

THE WATER SUPPLY OF PARIS.—Paris is at present receiving over 120,000 cubic mètres of pure spring water daily from the River Vanne, but even this large quantity is insufficient to meet the wants of all the inhabitants. A project is in contemplation by the municipality for laying down pipes which would convey a supply to all the inhabitants of the quarters now receiving water from the Seine or the Canal de l'Ourcq. The expense is estimated at £280,000 to £320,000.—*Engineering.*

REDUCTION IN THE PRICE OF GAS AT WREXHAM.—The Wrexham Gas-light Company have given notice that, from the 1st inst., the price of gas per 1000 feet will be reduced to the following rates, viz.:—Within a radius of one mile from Wrexham Parish Church, 3s. 9d.; above one mile and under two miles, 4s. 3d.; above two miles, 4s. 9d. A discount of 3d. per 1000 cubic feet will also be allowed upon all accounts paid at the Company's office within one month after the expiration of each quarter, provided there are no arrears of a previous account.

FIRE AT THE DOVER GAS-WORKS.—Last Thursday afternoon a fire occurred at the Dover Gas Company's works at Buckland, but fortunately it was confined to a small building used as a store, and did not affect the main structures. The fire is supposed to have been caused by a caldron of tar boiling over, while a strong east wind made the flames burn furiously, but at the same time blew them away from the principal buildings. The fire would doubtless have been much less destructive had there been an efficient water supply. It was nearly an hour from the alarm being given before a sufficient quantity of water was obtained to extinguish the flames. The water supply arrangements are under the control of the Town Council.

MANCHESTER SCIENTIFIC AND MECHANICAL SOCIETY.—At the meeting of this Society on Thursday last a lecture was delivered by Mr. Faulkner, of Manchester, on the recent development of apparatus for lighting by electricity, in which he referred to the numerous inventions which have of late been brought before the public, and also to some of his own inventions. In the discussion which followed, considerable doubt was expressed by the members as to the practicability of electricity, at least in the present state of science, producing anything like the results which had been claimed by inventors, whilst as a motive power the steam and the gas engine were considered to be far superior.

THE BRIGHTON AND HOVE GAS COMPANY'S BILL.—At a special meeting of the Brighton Town Council, held last Wednesday, it was resolved—"That the Town Clerk, under the direction of the General Purposes Committee, and on behalf of the Town Council, do oppose the Bill deposited in Parliament by the Brighton and Hove Gas Company, intituled 'A Bill to authorise the Brighton and Hove Gas Company to construct additional works, and to provide and supply lighting and heating agents other than gas, and to raise additional capital, and for other purposes,' and that the district fund be applied to the payment of the costs and expenses attending such opposition." The only objection urged against the Bill was to the proposal of the Company to supply, if necessary, the electric light. The other provisions of the measure were not mentioned in the discussion of the question.

LIGHTING RAILWAY CARRIAGES BY GAS.—The Australian papers which arrived last week report that the Commissioner of Railways has for some time past been causing experiments, under the superintendence of Mr. Dempster, to be made, with a view of lighting the Victorian railway carriages with gas instead of oil. The experiments were so far successful that on Tuesday night, Nov. 26, one of the carriages on the Williamstown line was lighted with gas instead of oil, and the superiority of the new system as regards the comfort of the passengers was at once evident. The method of providing the gas is by filling a reservoir placed beneath the carriage at a very high pressure, but in the consumption of the gas the pressure is controlled by a regulator, which prevents its being wasted. As the reservoirs in the different carriages are not in any way connected with each other, the light would not be extinguished by the uncoupling of any of the carriages. The reservoirs carry a supply which it is estimated would last for 36 hours if necessary. As the cost of lighting the carriages in this manner, after the apparatus has once been fitted up, is very much smaller than the expense entailed by the use of oil, the Minister intends to gradually extend the system to all the carriages on the Government railways. Great praise is due to Mr. Dempster for the energy and skill he has displayed in carrying out the experiments which resulted in the above-mentioned success.

SERIOUS ACCIDENT AT THE WITTON PARK GAS-WORKS.—Last Tuesday night an explosion of gas, resulting in severe injuries to eleven persons, occurred at the works of the Witton Park Gas and Coke Company, near Bishop Auckland. It seems that at about seven o'clock in the evening the gas all over the place suddenly went out, and upon an investigation being made, it was found that two of the gasholder pulleys had given way, tilting up one end of the holder in such a manner that the gas escaped in considerable quantities. A meeting of the Directors and Shareholders of the Company was being held at the time, but it was interrupted, and all adjourned to see what could be done towards re-

pairing the damage and putting the gasholder in working order again. This operation was proceeded with in safety, and with no indications of danger up to eleven o'clock, some 20 or 30 men, including some of the Directors, being engaged. Shortly after the hour mentioned, one of the men approached, with a light, the end of the holder which was tilted up, and a terrific explosion ensued. One end of the holder was completely lifted out of the tank, and the flaming gas extended to a distance of some 20 feet, the grass and herbage being scorched as far as that. The men at work were nearly all hurled to the ground by the force of the explosion, and when assistance arrived it was discovered that no less than eleven were more or less severely burnt. Beyond the the damage to the holder, no material injury to the works has been caused.

A Caution to Gas Fitters.—A most calamitous fire broke out last Saturday in the Free Reference Library, attached to the Birmingham and Midland Institute at Birmingham, the whole of the contents of that portion of the building, inclusive of the world-known "Shakespeare Library," being destroyed. The cause of the disaster has not yet been explained, but it is stated that about one o'clock in the afternoon a man, in the employ of the Gas Department of the Corporation, was engaged in thawing the gas-pipes, the supply of gas having been cut off through the frost, when, by a misadventure, he ignited some shavings, which were carried by a draught to other inflammable substances, causing flames which rapidly reached the Reference Library. The steam fire-engine did not arrive until three-quarters of an hour after the alarm was given, and even then its services were not available for a considerable time, from the frozen state of the water mains. The fire rapidly extended from the Reference Library to the Free Lending Library underneath, and continued its course almost unchecked until the whole of this portion of the extensive buildings was gutted, nothing but the outer walls remaining. The building and its contents were insured to the extent of £24,000, but of course the magnitude of the disaster cannot be gauged by any pecuniary estimate, many of the volumes destroyed being absolutely unique.

The Water Supply of Alfreton.—For some years past the inhabitants of the parish of Alfreton, containing about 14,000 inhabitants, have been suffering, especially in dry seasons, from a deficient supply of water. To remedy this state of things, the Belper Board of Guardians, as the Sanitary Authority, recently caused steps to be taken for furnishing the inhabitants with the necessary supply. In order to do this, it has been decided to obtain water from Lindway Lane and Butterley, five miles from Alfreton. These places are on the gritstone formation north of Alfreton, and the water will be conveyed by gravitation. It is believed that the quantity of water obtained from never-failing springs, from the drainage of the watershed, and other sources, will be, even in the driest periods, sufficient to supply the necessities of the population, whose natural resources for obtaining water have been, for some years, in a measure cut off by the pits, into the workings of which the water of the district has been drained. It is estimated that the total expense of the undertaking, before it is completed, will amount to upwards of £18,000, the repayment of which will be spread over a number of years. The completion of the work was to have been effected by August next, but it is thought that the time will have to be extended, unforeseen difficulties having intervened. The task of laying the main-pipes, 7 inches in diameter, has, in some places, presented greater difficulties than were expected, owing to the excavators having to cut through the solid rock.

Gas Heating and Ventilating Apparatus.—An apparatus for the purpose of heating and ventilating by means of gas has been contrived by M. Roger, jun. It consists of a series of vertical tubes, mounted at the lower extremity upon a conical and circular furnace. At their upper extremity they all unite in a heat-box, which communicates directly with the pipe serving to carry off the products of combustion and the vitiated air of the apartment to be heated. Under each vertical tube is placed a burner having the form of a candle, surmounted by a cap. The air necessary for combustion is obtained exclusively from the apartment, and thus a vigorous and constant ventilation is established, since the vitiated air is either burned in its passage to the burners, or quickly drawn into the tubes and the discharge-pipe, without having the slightest chance of returning again to its point of departure. The air to be warmed is entirely separated from the vitiated air; the warmed air is, therefore, strictly pure, being drawn from the outside, without the slightest possible admixture of the vitiated air of the apartment. The unvitiated air is introduced by means of an inlet-pipe fixed in the centre of the apparatus. It is warmed by circulating around the pipes and the heat-box, and enters the apartment through openings in the outer casing. In order to avoid any dryness of the heated air, there is placed near the furnace a reservoir to contain water, which will impart the necessary moisture. The apparatus may be constructed entirely of metal, wrought or cast iron, copper, or tin. The outer casing may be made of any other material, according to the requirements of heating or decoration.

The Theory of the Electric Light.—Mr. W. H. Preece, the Electrician of the General Post Office, has contributed an article on the above subject to the current number of the *Philosophical Magazine*. In noticing it *The Times* says:—"Mr. Preece points out that the theory of the electric light cannot be brought absolutely within the domain of quantitative mathematics, for the reason that we do not yet know the exact relationship existing between the production of heat and the emission of light with a given current. We do, however, know sufficient to predicate that what is true for the production of heat is equally true for the production of light beyond certain limits. He shows that the full effect of a current can only be obtained by one lamp on a short circuit, and that when we add to the lamp by inserting more of them on the same circuit, or on a circuit so that the current is subdivided, the light emitted by each lamp is diminished in the one case by the square, and in the other case by the cube of the number inserted. With dynamo-electric machines there is a limit which has to be reached before this law begins to act. With the Wallace-Farmer machine this limit appears to be six lamps; in the Gramme machine and Jablochkoff candle it is five. The Gramme machine in use on the Thames Embankment is practically four distinct machines. It is this partial success in multiplying the light that, in Mr. Preece's opinion, has led so many sanguine experimenters to anticipate the ultimate possibility of its extensive subdivision—a possibility which he demonstrates in his paper to be hopeless, and which experiment has hitherto proved to be fallacious."

Proposed Purchase of the Margate Water-Works by the Town Council.—At the meeting of the Margate Town Council last Tuesday, the Water-Works Committee reported that it was desirable that the Council should acquire the works and property of the Margate and Broadstairs Water-Works Company, the Directors of the Company having offered to sell their works, as they are now in operation, together with their surplus land and money in the funds, with all rights, powers, and privileges conferred on the Company by their Acts of Parliament or otherwise, and free from all encumbrances, for the sum of £5900 (such sum to include compensation to their officials); and they had also suggested that this purchase-money should be paid by means of debentures charged on the water and the general district or borough rate, issued at par and bearing interest at 4½ per cent. The Committee recommended that the transfer should take effect as from Jan. 1, 1879, and that, until the purchase be sealed, the Company be requested to take the management of the concern on behalf of the Council. In the course of the discussion of the matter, it was proposed that, before being purchased, the works should be inspected by a competent authority, who should report upon their condition. The members, however, were nearly equally divided as to the necessity of such a step, some contending that the employment of an engineer to make an inspection would be a waste of money, while others argued that it was necessary, and would be a saving in the end. Ultimately, as certain of the members are Shareholders in the Water Company, and therefore could not vote, the amendment was carried by a majority of one.

The Water Supply of Limerick.—A special meeting of the Limerick Town Council, as the Urban Sanitary Board, was held on Tuesday last, with the view of taking final action for improving the present water supply of Limerick. Mr. R. Bourke, Local Government Board Inspector, attended by request, and gave it as his opinion that the water was not of the quality to be desired. The pressure was not sufficient, and, under all the circumstances of the case, he suggested that a deputation from the Corporation should meet one from the Water-Works Company, and confer as to details. If the Company were in a position to improve the present system of supply, then the Corporation could compel them, under the 62nd section of the Public Health (Ireland) Act, to do so. Alderman Tinsley, the local agent of the Company, denied that the water was not of good quality. All the analyses made had proved the water to be good, and the present pressure could be improved to meet all the requirements of the city. Foreseeing the course events were likely to take, the Company had recently erected a third pumping-engine, so that they could supply an unlimited quantity of water, having the Shannon to draw from. In Cork and Dublin there was a public rate of 3d. in the pound for water, whereas the whole amount paid for water by the Limerick Corporation, during the year 1878, was only £366, or scarcely 1½d. in the pound. After considerable discussion, it was agreed to call on the Company to supply the city with a better quality of water than that at present furnished to the citizens, and at a more reasonable price; the pressure to be higher, and the supply continuous.

The Water Supply of East Brent.—Archdeacon Denison, whose efforts to secure a sufficient supply of pure water for East Brent and the neighbourhood have several times been noticed in this Journal, has recently developed a further source. Twelve years ago, close by one of the watercourses which collect and bring down the waters of the Knoll, he traced and recovered, at a depth of 10 feet from the surface, a spring which has never failed since. The water is certified by the highest authority as water of "extraordinary organic purity." The least yield of it has been one gallon a minute; the greatest ten gallons a minute. Having recovered the spring, and having, besides, a vast supply of surface water from the Knoll as pure as can be had, there being nothing on the hill to taint the water, he began to contruct a succession of reservoirs on the side of the Knoll opposite the vicarage house, and last year he developed another copious spring. Finding the water from the two springs much more than sufficient, even in summer, for all purposes of supply to the vicarage house with its surroundings, and also to the entire village of East Brent, he shut off the reservoir water, which, after heavy rains, was for some days clouded, and drew the supply wholly from the springs, with the power, at pleasure, of supplementing their supply from the reservoirs in a time of exceptional drought. The general results are that he is left with great abundance of water in store in the reservoirs, and that the vicarage house, with its surroundings, and all the village of East Brent, are supplied with an unfailing and abundant supply of purest and best spring water, with an overflow daily, after all wants are supplied, of not less at this time than twelve gallons a minute running to waste; in summer time of not less than five gallons a minute. For the general supply of villages about the Knoll, he is satisfied, from long observation and experience, that if the Knoll were properly tapped, the supply of water, together with the storing of surface water, for which there are exceptional facilities in the formation of the lower parts of the Knoll, would be more than sufficient for the use of all these villages. In reference to this matter, the Archdeacon writes to *The Times*:—"At a time when so much is naturally said and written about the supply of pure water, it seems a public wrong that advantage should not be taken in this locality of the great natural reservoir and source of supply, Brent Knoll. Almost every day I look at my 12 gallons a minute of purest water—more than 300 hogsheads in 24 hours—running to waste, with great regret for the loss of health and comfort which this supply might be made to bring to many hundreds of people."

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

5311.—Ross, A. Q., Cincinnati, U.S.A., "Improvements in processes and apparatuses or means for charging and discharging gas-retorts." (Complete specification.) Dec. 30, 1878.

5315.—Ripley, R. S., Strand, London, "Improvements in gas-retorts and in the manufacture of gas." A communication. (Complete specification.) Dec. 30, 1878.

2.—Williams, H., and Baron, J., Southport, Lancs, "Improvements in and relating to atmospheric air and gas motor engines." Jan. 1, 1879.

3.—Nicholson, J. C., Liverpool, "Improvements in and relating to hose and pipe couplings." Jan. 1, 1879.

27.—Raworth, B. A., Manchester, "Improvements in apparatus for producing electric light." Jan. 3, 1879.

29.—Stott, J., Oldham, Lancs, "Improvements in gas pressure regulators." Jan. 3, 1879.

38.—Livesey, J., Westminster, and Kidd, J., Wandsworth, London, "Improvements in apparatus for enriching illuminating gas." Jan. 3, 1879.

65.—Clark, A. M., Chancery Lane, London, "Improvements in electric lamps." A communication. Jan. 6, 1879.

81.—Hedges, K. W., Westminster, "Improvements in electric lamps." Jan. 8, 1879.

83.—Ladd, W., Beak Street, London, "Improvements in electric lamps." A communication. Jan. 8, 1879.

93.—Melling, T., Aigburth, Lancs, "Improvements in water-meters, or apparatus for measuring and registering the quantity of water or other fluid flowing through pipes or other conduits, and for generating motive power." Jan. 9, 1879.

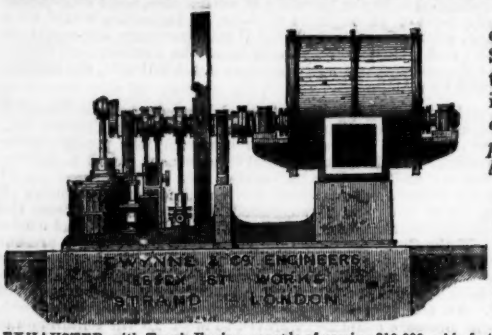
PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2695.—Mackay, G., Edinburgh, "Improvements in the purification of liquids, and in the utilization and preparation of certain waste and bye-products of art and manufacture as purifying agents." July 5, 1878.

4283.—Stokes, J. E., Upton Manor, Essex, "Improvements in obtaining light by electricity, and an apparatus for its application to illuminating purposes." Oct. 25, 1878.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

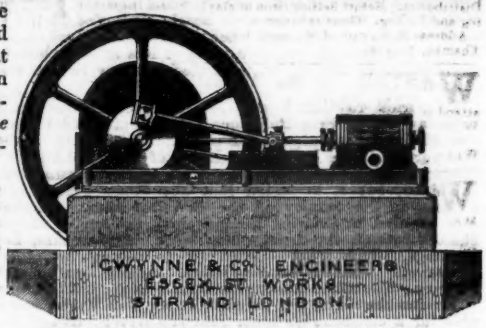
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

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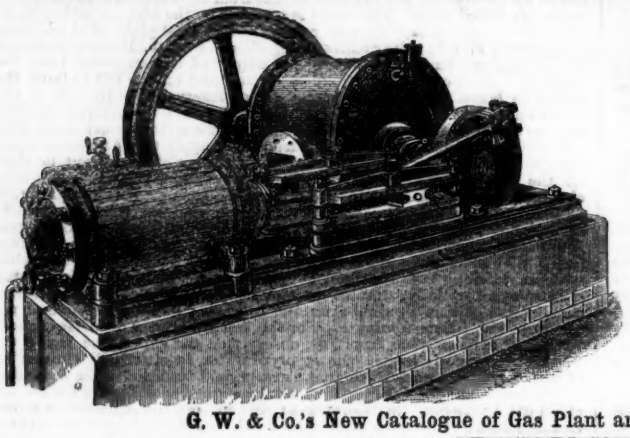
Wrought-Iron Spindles and

ENGINES COMBINED.



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TAR, LIQUOR, AND OTHER PUMPS,
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HOLLAND STREET, SOUTHWARK, S.E.

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Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

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WET AND DRY GAS-METERS,

As supplied to The Gaslight and Coke Company, of London, the South Metropolitan, and other principal Gas Companies,

BY THE

IMPERIAL METER COMPANY,

LIMITED.

MANUFACTURERS ALSO OF

Station-Governors, Consumers Dry Governors,

STATION-METERS, STREET-LAMP METERS, &c., &c.

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WANTED, a Situation as Retort-Setter, by an experienced man. No objection to go abroad.
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WANTED, a Re-engagement as Work-ing MANAGER of small Gas-Works. 18 years practical experience in the Manufacture of Gas and its Distribution; Retort Setting (iron or clay); Meter Inspecting and Fitting. Good references.
Address E. S., care of Manager, Gas-Works, Walton-on-Thames, SURREY.

WANTED, by the Maidstone Water-Works Company, a Working INSPECTOR to attend to House and other Fittings for the Prevention of Waste, and to do repairs.
Apply, by letter, stating wages required, to WILLIAM WARE, at the Offices of the Company, MAIDSTONE.

WANTED, by a young Married Man, a Situation as MANAGER, or SECRETARY and MANAGER of a Gas-Works, where the make is about 10 or 15 million cubic feet per annum. 4 years in last situation. Has had considerable experience in the Manufacture and Distribution of Gas in all its branches. No objection to go abroad. Unexceptionable references and testimonials. Satisfactory reasons for change.
Address, in first instance, No. 515, care of Mr. King, 1, Bolt Court, FLEET STREET, E.C.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.
John Leigh, Esq., M.R.C.S., F.C.S., &c ,&c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

TO FOREMEN TAR DISTILLERS.

AN active intelligent Working Foreman required for small factory in the Provinces; with knowledge of Ammonia preferred.
Apply, by letter, with particulars and references, to No. 518, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Andover Gas and Coke Company are in want of a Working MANAGER. Must be a good hand at Fittings, Retort Settings, and Exhausting Machinery; residence on the works.
Apply, with testimonials and requirements, to S. SHAW, the Clerk, Gas-Works, ANDOVER.

RUNCORN GAS COMPANY.

TENDERS are invited for the Re-sheeting, &c., of a 50 ft. by 40 ft. Telescopic GASHOLDER.
Specifications and all information may be obtained from the undersigned, to whom tenders must be sent not later than the 4th day of February next.
J. R. FRITH, Secretary and Engineer.
Gas-Works, Runcorn, Jan. 10, 1879.

THE Lytham Improvement Commis-sioners have FOR SALE one 6-in. Patent four-way CENTRE VALVE, by Messrs C. and W. Walkers, and four PURIFIERS 5 ft. 6 in. square, with Grates and Bars; also a quantity of OLD METAL.
For any further information apply to Mr. BOWER, Gas-Works, Lytham, LANCASHIRE.

THE Gas Committee of the Leeds Cor-poration are prepared to receive OFFERS for a Telescopic GASHOLDER, 50 ft. by 24 ft., with Guide-Framing, and Balance-Weights complete, and in excellent condition.
Further particulars may be had on application to Mr. Woodall, Engineer.
Tenders to be addressed "Chairman, Gas Office," on or before the 25th inst.
Jan. 11, 1879. H. WOODALL.

AMMONIACAL LIQUOR.

THE Directors of the Exeter Gaslight and Coke Company are prepared to receive TENDERS for the whole of the AMMONIACAL LIQUOR produced at their Works for One year from the 25th of March next.
Contractors to state price at per 1000 gallons of 6 degrees Twaddel, delivered into tank at the Company's Works; and sealed tenders, endorsed "Tender for Ammoniacal Liquor," to be sent to me, the undersigned, on or before Monday, the 17th day of February next.
The Directors do not bind themselves to accept the highest or any tender. By order,
W. A. FADFIELD, Secretary.
Gaslight Offices, Exeter, Jan. 9, 1879.

AMMONIACAL LIQUOR.

SPENCE and STEUART, Frizinghall, near Shipley, YORKSHIRE, are Purchasers of above.

THE Woolton Gas Company have for disposal a quantity of GAS PLANT suitable for a small Gas-Works. Consisting of Hydraulic Main, Mouthpieces, Ascension-Pipes, 6-in. Condensers, Scrubber, set of four Purifiers, 5 ft. square and 3 ft. deep, with Grids and Centre-Valve, complete. All the above is in good order, having recently been replaced by larger plant.
All information may be obtained from the undersigned, at the Gas-Works, Woolton, near Liverpool.
HENRY HATCH, Manager.

THE Directors of the Wareham Gas Company are desirous of receiving TENDERS for the Supply of from 320 to 350 Tons of Pelaw Main GAS COALS (best quality), to be delivered free of charge into lighters at Russell Quay. The first delivery to be made not later than the 15th of April next, the remainder not later than the 1st of September next.
Payment for same to be made four months after delivery.
Tenders to be sent in to the Office of the Gas Company, Wareham, on or before the 29th inst., addressed to the Secretary.
The Directors do not bind themselves to accept the lowest or any tender.
G. C. FILLITER, Secretary.
Wareham, Dorset, Jan. 8, 1879.

TENDERS FOR SULPHATE OF AMMONIA AND TAR.

THE Directors of the Devonport Gas and Coke Company are prepared to receive TENDERS for their make of SULPHATE of AMMONIA and their surplus TAR, for a period of Twelve months, from Feb. 1, 1879.
Estimated make of Sulphate about 100 tons per annum; surplus Tar, 50,000 gallons.
Specifications may be had on application to the Secretary.
Tenders to be delivered on or before Monday, the 20th inst., addressed to the Chairman, Devonport Gas and Coke Company.
By order,
JOHN WILLING, Secretary.

WESTON-SUPER-MARE GASLIGHT AND COKE COMPANY.

TO BE SOLD BY TENDER, a quantity of GAS PLANT suitable for a medium-sized Gas-Works, consisting of a 30 ft. Gasholder, together with one Station-Meter. Capacity, 5000 ft. per hour, with three 8-in. Valves and connections complete.
Set of Six PURIFIERS, 9 ft. by 6 ft., and 3 ft. 6 in. deep, with Trays and two Centre Valves complete. Two Columns, two Guides, and frame belonging thereto.
One SCRUBBER, 8 ft. by 7 ft., with Iron Trays, Centre Table, and other necessary connections.
One 8-in. GOVERNOR, and also a quantity of piping and other miscellaneous articles.
The above are to be disposed of in consequence of recent extension and enlargement of the works.
Tenders to be sent addressed to the Secretary, and the Directors do not pledge themselves to accept the lowest or any tender
For further particulars apply to Mr. John Perry, Manager, or to
W. H. DAVIES, Solicitor, Secretary.

TO ENGINEERS & MANAGERS.—CLIFTON'S

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COUNTY OF DURHAM.

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LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.

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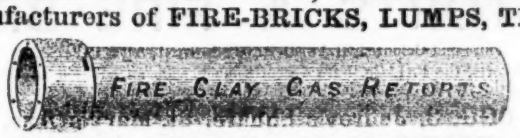
Manufacturers of FIRE-BRICKS, LUMPS, TILES,



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OF

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See Page 61.

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MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.
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WROUGHT-IRON TUBES AND FITTINGS
FOR GAS, STEAM, AND WATER.
Hot Water Tubes, Core Bars, Lap-welded Iron Boiler Tubes.
CAST-IRON PIPES for GAS & WATER.
Brass and Gun-Metal Fittings, Valves, Cutting and Screwing Tools, &c.

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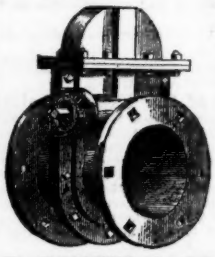
IMPROVED GAS-VALVES
WITH WROUGHT-IRON PINIONS.

List of prices, with full dimensions of all sizes up to 48-inch, to be had on application.
These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.
In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.
ALSO SOLE MAKERS OF
J. BEALE'S NEW PATENT GAS EXHAUSTERS,
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Of every size and shape, and of the best quality; also of White and Coloured GLAZED BRICKS, SANITARY PIPES, &c., &c.
In order to meet the constantly increasing demand for their Gas-Retorts, the F. I. Co. have recently made such an addition to their premises as will enable them to execute expeditiously the largest home or foreign orders.
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SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owingto their compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

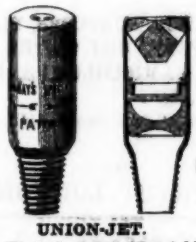
DESCRIPTIVE CATALOGUE

OF

BRAY'S "ENAMEL" GAS-BURNERS.

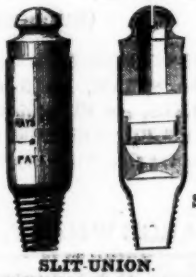
In presenting this Catalogue, we wish it to be known that we are the only Manufacturers in Great Britain of Non-Corrosive Slit-Union Burners. We make them under Patents taken out here, and in several Foreign countries, of our own material, "Enamel," which is much harder and less brittle than "Steotite" (of which the imported Slit-Unions are made), and, therefore, less liable to fracture. We may also state that our burner factory is the most extensive in the World, and the only one in which composite Non-Corrosive Gas-burners are made *in all their parts*,—facts which give us the power of meeting the various requirements of gas illumination in a way that cannot be accomplished by those who make up burners from parts which are purchased from widely scattered sources.

BRAY'S "SPECIAL"



All these Burners are stamped with Trade Mark as shown in wood cut.

UNION-JET.



SLIT-UNION.

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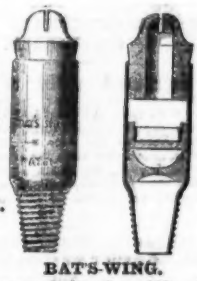

BAT'S-WING.

We believe our "Special" Burners, as improved, are more adaptable to the requirements of gas illumination than any now before the public. They can be made to suit any pressure or quality of gas (including air gas), give a well-shaped and steady flame, the gas inlet is so placed that it cannot be tampered with, and they are not liable to get out of order.

TWO DISTINCT CLASSES of burners are made, as regards lighting power—viz., for "*Highest Lighting Power*," and "*Medium Lighting Power*."

THE HIGHEST LIGHTING POWER CLASS are made to develop the greatest possible amount of light as tested in the Laboratory, and they surpass those supplied by any other maker or dealer, whatever the price charged. When this class is required, it must be distinctly stated so when ordering, at the same time giving quality of gas, and consumption required.

THE MEDIUM LIGHTING POWER CLASS are those which our experience leads us to recommend for general use, in preference to any which yield in the Laboratory the highest lighting power. The latter, whoever they are made by, will always be within, or near, the smoking point, and smoke freely with the slightest atmospheric commotion. To avoid the evils arising from these features, we recommend our medium lighting-power burners, the flames of which are kept well away from the smoking point, and are made to withstand atmospheric commotion better than the other class; and will do good service at a lower pressure, and give, we doubt not, *in general use*, as much light. All our "Special" burners are sent out of "Medium Lighting Power Class," unless otherwise ordered.

THE SIZES OF BURNERS are from No. 0 to 9 inclusive.

FOR SIXTEEN-CANDLE GAS (or 14 to 18 candles), the sizes from No. 4 to 9, inclusive, are those which yield the best results from 4 feet of gas and upwards; the lower numbers are for less consumptions.

FOR TWENTY-CANDLE GAS (or 19 to 22 candles), the sizes from No. 3 to 8, inclusive, yield the best results from 3 feet of gas and upwards; the lower numbers being for less consumptions.

FOR TWENTY-FIVE CANDLE GAS (or 23 to 27 candles), the sizes from No. 4 to 9, inclusive, yield the best results from 2½ feet and upwards. When burners are required for this quality, "for Cannel gas" must be distinctly stated when ordering.

FOR OTHER QUALITIES OF GAS (including air gas), burners are made to order.

PRESSURE. All our "Special" burners are made (unless otherwise ordered) to give a suitable spread of flame at five-tenths pressure, and keep in good shape up to twenty-tenths; but we make to order suitable for any specified pressure up to forty-tenths.

STREET-LAMPS. For this purpose these burners are of exceptional value. Those suitable for consumptions of, say, 3, 4, or 5 feet per hour may be made to consume that quantity at any specified pressure from five-tenths to forty-tenths; therefore, a selection of burners may be had, adapted to the several pressures of a town, by the use of which the consumption in the lamps may be balanced with a nicety not equalled by the ordinary working of governors, with the further great advantage of a reduced consumption, when the light is not required, by the usual reduction of pressure in the street-mains at midnight. In ordering for this purpose, it is necessary to state the quality of gas, the consumption, and the number of burners required for each pressure. Extended particulars on this subject will be supplied on application.

FITTINGS. We make our burners to suit the fittings of any country, but, unless otherwise ordered, they are sent out English taper-screw.

FOR GLOBES, the "Bat's-wings" are not suitable, the "Union-Jets" and the "Slit-Unions" are.

BRAY'S "ENAMEL" REGULATORS.

All these Burners are Stamped "Bray's Patent Enamel Regulator," as shown in wood cut.

UNION-JET.

SLIT-UNION.

All these Burners are Stamped "Bray's Patent Enamel Regulator," as shown in wood cut.

BAT'S-WING.

THE NAME "Regulator" was given to these burners when introduced eleven years ago, because burners having a medium in their interior for gas to pass through, had then become known as "Regulators." Our Union-Jets and Bat's-wings were originally introduced (and now the Slit-Unions are added) to remove two defects in the common metal burners—corrosion and roaring flames,—and our enterprise has been so far successful that the metal burners have been almost supplanted. A steady well-shaped flame is produced by the combined excellence of the tip and the medium through which the gas has to pass in the interior of the burner.

LIGHTING POWER. Though their lighting power is not equal to the "Specials," nor so much under control, yet they are far superior, in this respect, to the common metal burners, with which they closely correspond in price.

THE SIZES are, in Union-Jets and Slit-Unions, Nos. 0 to 8, in Bat's-wings, Nos. 0 to 10 inclusive.

BRAY'S "ENAMEL" NON-REGULATOR.

These are similar burners in outward appearance to the Regulators, but somewhat less, and are without the interior regulating medium. Though they do not prevent the roaring and flickering, as the regulators do, they are excellent burners at the price charged. Our name is not stamped on these burners.

THE SIZES are, in Union-Jets and Slit-Unions, Nos. 0 to 8, and in Bat's-wings, Nos. 0 to 10 inclusive.

BRAY'S MARKET BURNERS.

These are Bat's-wings of unusually large size, and are admirably adapted for markets, butchers, and any purpose for which an immense flame is essential.

THE SIZES ARE Nos. 19 and 20.

All these burners are stamped "Bray's Market Burner," as shown in wood cut.

The RAT'S-TAIL or ONE-HOLE BURNER.

This burner shoots out a straight jet, like a rat's tail, and is used to some extent in Scotland for illuminating purposes; and there, as elsewhere, for heating, cooking, pipe lighting, and other purposes.

THE SIZES kept in stock are Nos. 0 to 6 inclusive, but any other size is made to order.

Every Description of Gas-Burner not herein mentioned made to order in "Enamel."

GEO. BRAY & CO., BLACKMAN LANE, LEEDS.

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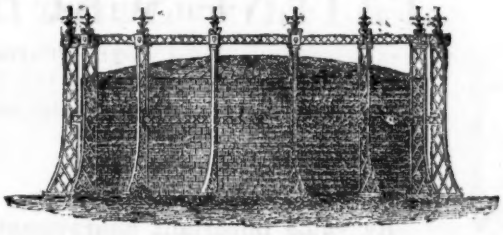

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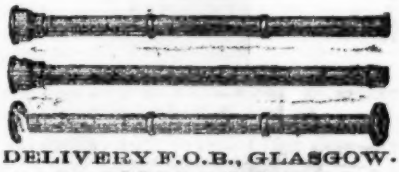

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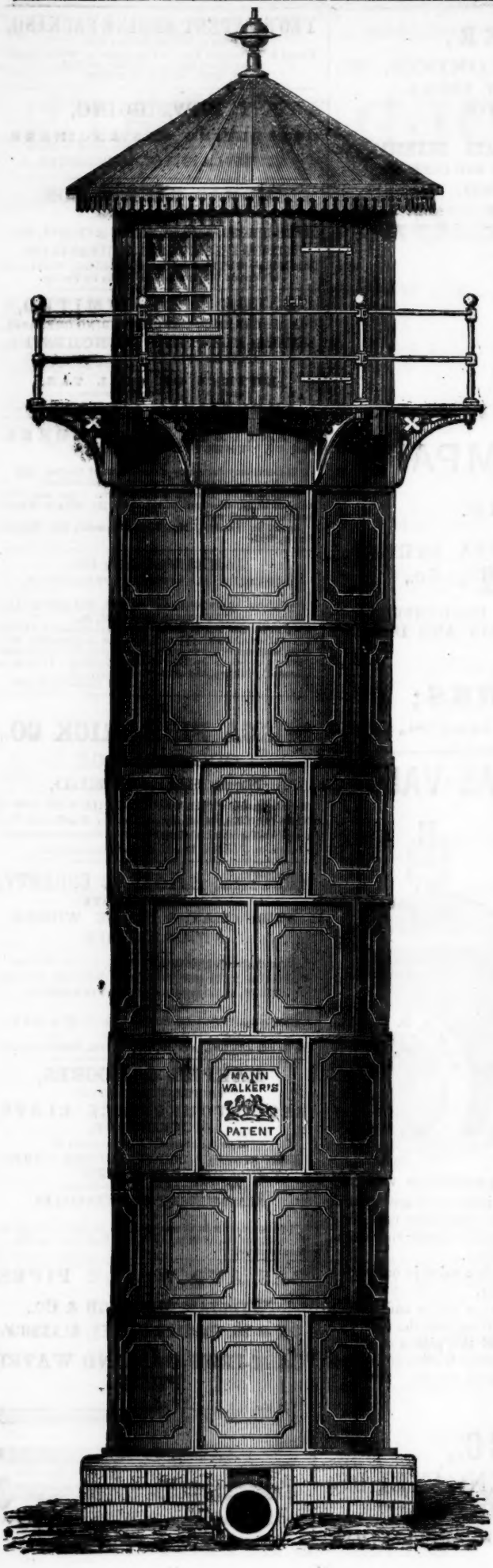

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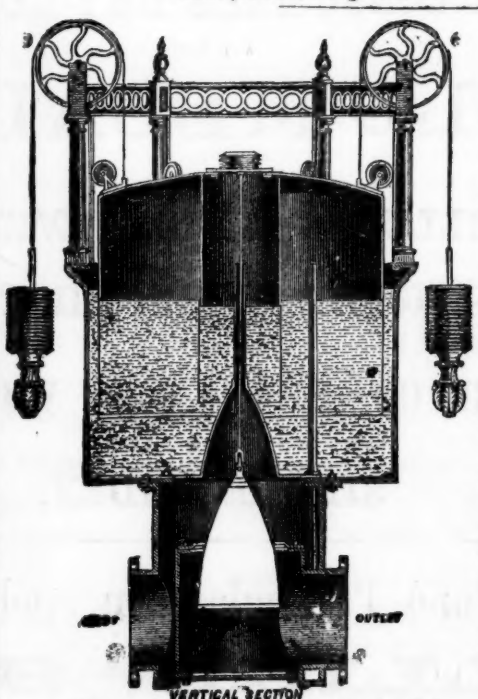

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

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Offices, Mersey Street, Warrington, April 23, 1877.

"MESSRS. NEWTON, CHAMBERS, AND CO.,

"GENTLEMEN,—After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

"The average of Nine samples gives a yield of **12,500** cubic feet of **15½**-Candle Gas, being equivalent to **664** lbs. of sperm per ton, and **1420** lbs. of fixed carbon of a very superior quality. All the samples bear a close relation to each other in value.

"Yours truly,

"JAMES PATERSON."

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The object attained by this invention is the *correct measurement of Gas under every fluctuation of the pressure.*

Accuracy is obtained by subjecting the whole of the water which determines the measuring chambers of the drum to one uniform even pressure, and so prevents unequal displacements of the water-line.

The "RELIANCE" METER has been tested by several of the most experienced official meter inspectors. Copies of their reports may be obtained on application to the

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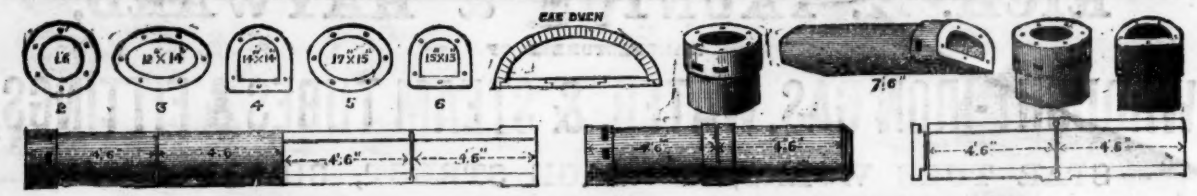

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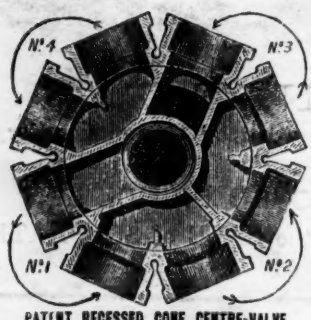

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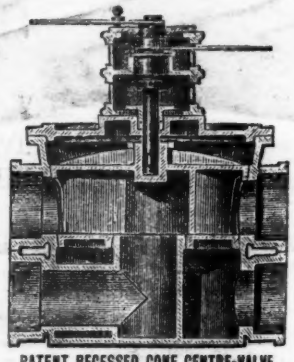

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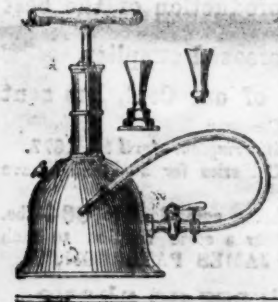

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